AIRCRAFT POWER

SOFTWARE USER MANUAL

AIRCRAFT POWER V23-1

1. Table of contents

2. About this document

This is the user's manual for the Aircraft Power application consisting of two modules, one for DC and one for AC measurements.

Legend

The following symbols and formats will be used throughout the document.

Important
It gives you important information about the subject.
Please read carefully!

Hint
It gives you a hint or provides additional information about a subject.

Example
Give you an example of a specific subject.

3. Introduction

The Aircraft Power DC math module calculates the voltage and current characteristics for DC supply systems.
The Aircraft Power AC module calculates the voltage, current, and power characteristic of 1-phase and 3-phase 400 Hz systems.

Related standards for aircraft power measurements are listed below:

- MIL-STD-704F
- GJB181x-xxxx
- GJB 5558-2006
- ISO 12384:2010
- ISO 1540:2006

This manual has two sections, one for Aircraft Power AC and then one for Aircraft Power DC.

4. Add and set-up Aircraft Power AC

4.1. Add Aircraft Power AC module to a setup configuration

The Aircraft Power AC module can be added to the setup by clicking on the More (+) button and then selecting the Aircraft Power AC module located under the Electrical measurements section:

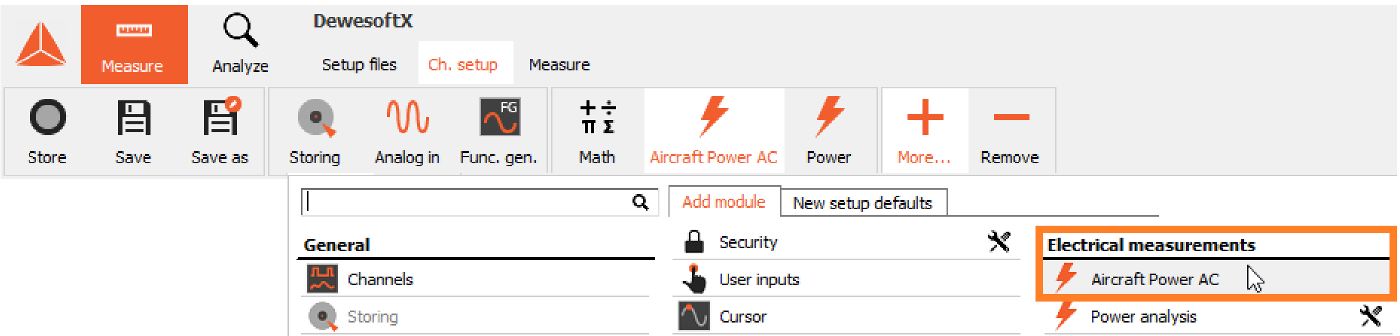
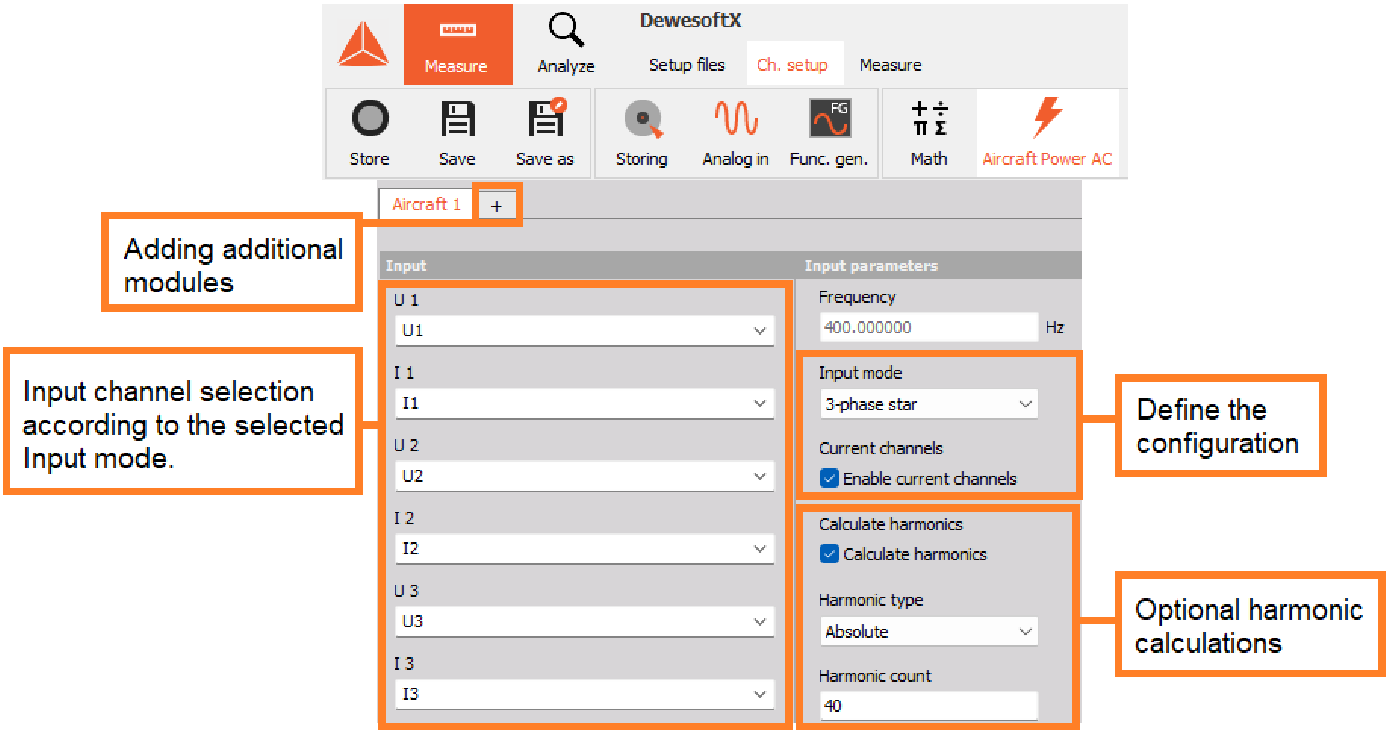


Illustration of how to add the Aircraft Power AC module to a setup.

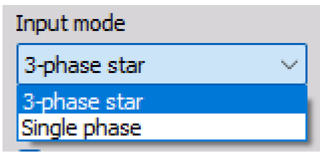
4.2. Settings for Aircraft Power AC

An overview of the module setup page is shown below:



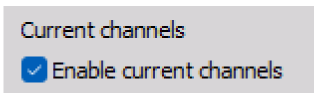
Overview of the user interface for configuring the Aircraft Power AC module.

The first step after adding the Aircraft Power AC module is to define the Input mode configuration. You can choose between Single phase and 3-phase star configuration.



Input mode settings.

Enabling current channels will also provide the power parameter results:

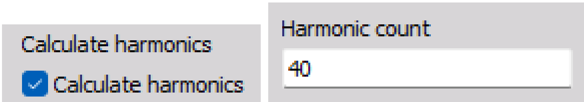


Current channels settings.

The input channel selector for voltage and current channels is updated depending on the selected configuration.

NOTE: Make sure the unit for voltage is ”V” and the unit for current is “A” to get correct output results in “Watt”.

Optionally a user-defined number of harmonic components can be calculated (40 in the example below):

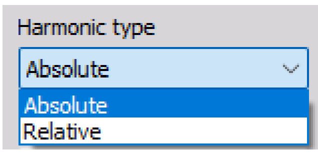


Harmonic calculation settings.

If e.g. the Harmonic count is set to 40 then the integer harmonic components from 1 to 40 are analyzed. The maximum Harmonic count is dependent on the Nyquist frequency of the analog input Acquisition sample rate. For example, if the AI sample rate is 100 kHz then the maximum integer harmonic is 125, based on the formula shown below:

$$\text{Max. harmonic} = \frac{\text{Sample rate}}{2 \cdot \text{Line frequency}} = \frac{100kHz}{2 \cdot 400Hz} = 125$$

In case the Harmonic type is selected as “Relative”, the amplitude results are relative to the first harmonic.

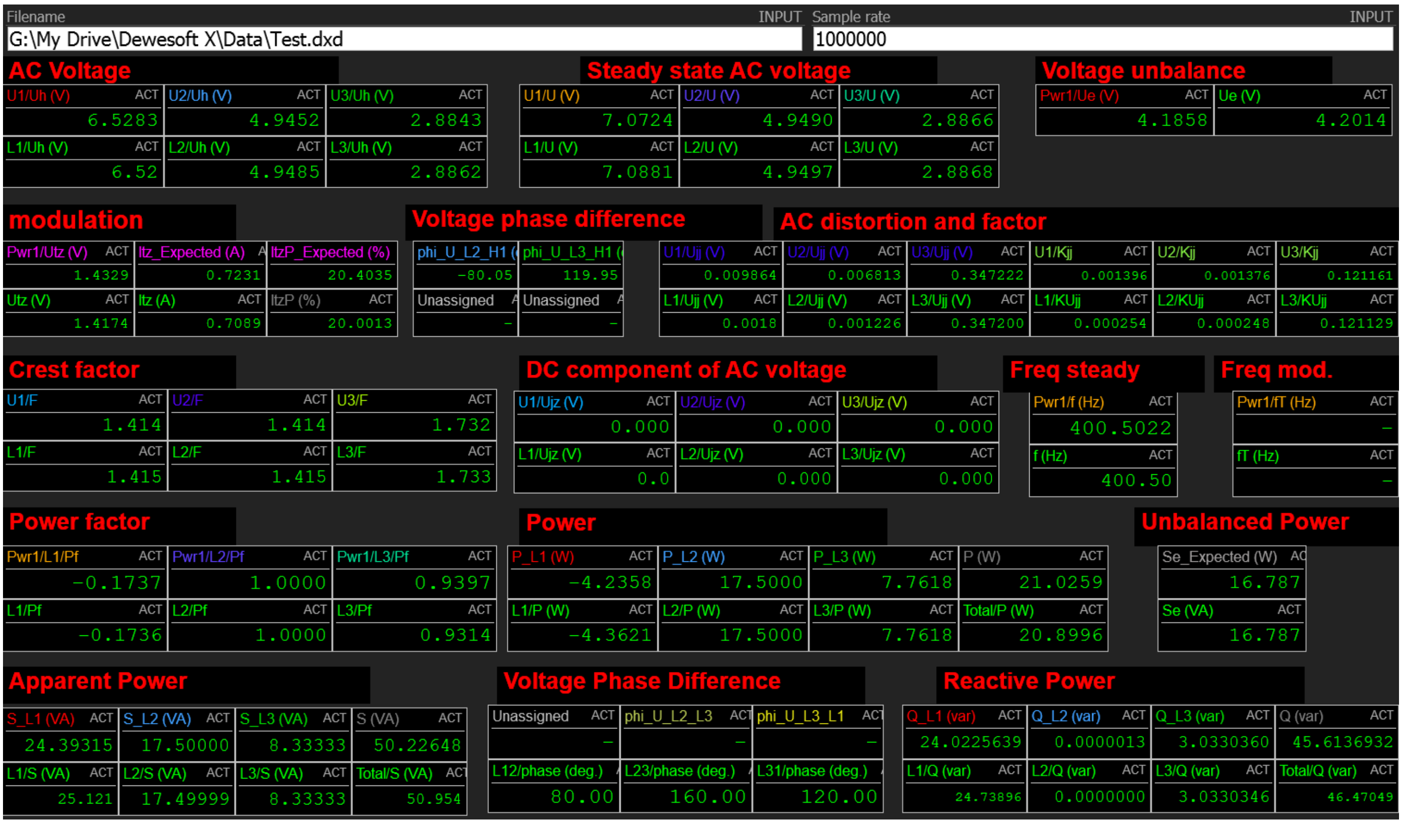


Harmonic type settings.

Multiple modules with different calculation parameters can be added by pressing the + button at the top of the setup page.
The line Frequency is fixed to 400 Hz ±10%.

5. Measuring and visualization of Aircraft Power AC

After completing the configuration of the module, the calculated output data can be monitored while measuring by going to the Measure tab, as illustrated below:



An example of how data results can be illustrated in Measure mode. The display can be modified as desired by the user.

In Measure mode the acquired and calculated aircraft data can be displayed in multiple different display widget, which can be selected under the tab

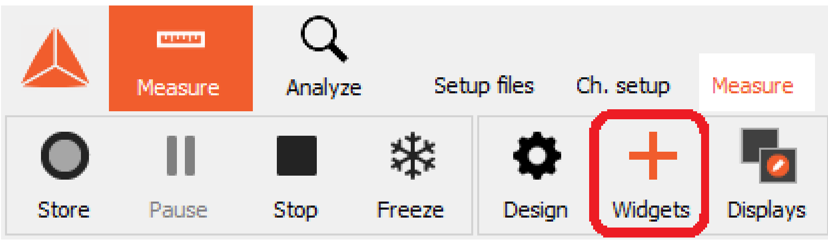


Illustration of how to add visual widgets to a Measure display.

6. Channel output overview for Aircraft Power AC

Depending on the settings the listed results are calculated and stored. The table below gives an overview of all possible channels. √H means results are only available if Calculate harmonics is enabled.

Calculated output channels			Single Phase		3 Phase star	
Ch Name	Unit	Description	Voltage	Current	Voltage	Current
Ue	V	Voltage unbalance	-	-	√	√
Utz	V	Total voltage modulation amplitude	-	-	√	√
f	Hz	Steady state frequency	√	√	√	√
fT	Hz	Frequency modulation amplitude	√	√	√	√
Total/P	W	Total active power	-	-	-	√
Total/S	VA	Total apparent power	-	-	-	√
Total/Q	var	Total reactive power	-	-	-	√
Se	VA	Unbalanced power	-	-	-	√
Itz	A	Total current modulation amplitude	-	-	-	√
ItzP	%	Total current modulation percent	-	-	-	√
Lx/Uh	V	Lx AC voltage	√	√	√	√
Lx/U	V	Lx steady state AC voltage	√	√	√	√
Lx/Ujz	V	Lx DC component of the AC voltage	√	√	√	√
Lx/Ujj	V	Lx AC voltage distortion	√	√	√	√
Lx/KUjj		Lx AC voltage distortion factor	√	√	√	√
Lx/F		Lx crest factor	√	√	√	√
Lx/P	W	Lx active power	-	√	-	√
Lx/S	VA	Lx apparent power	-	√	-	√
Lx/Q	var	Lx reactive power	-	√	-	√
Lx/Pf		Lx power factor	-	√	-	√
Lxy/phase	deg.	Phase difference Lx to Ly	-	-	√	√
Lx/Ih	A	Lx AC current	-	√	-	√
Lx/I	A	Lx steady state AC current	-	√	-	√
Lx/Itz	A	Lx AC current modulation amplitude	-	√	-	√
Lx/ItzP	%	Lx AC current modulation percent	-	√	-	√
Lx/Ijj	A	Lx AC current distortion	-	√	-	√
Lx/KIjj		Lx AC current distortion factor	-	√	-	√
Lx/Utz	V	Lx Voltage modulation	√	√	√	√
Lx/U_H	V/%	Lx Voltage harmonic in V or %	√H	√H	√H	√H
Lx/U_H1	V	Lx first voltage harmonic	√H	√H	√H	√H
Lx/I_H	I/%	Lx current harmonic in A or %	-	√H	-	√H
Lx/I_H1	V	Lx first current harmonic	-	√H	-	√H
Lx/phiU_H	deg.	Lx voltage harmonic phase angle	√H	√H	√H	√H
Lx/phiU_H1	deg.	Lx first voltage harmonic phase angle	√H	√H	√H	√H
Lx/phiI_H	deg.	Lx current harmonic phase angle	-	√H	-	√H
Lx/phi_H1	deg.	Lx phase between voltage and current	-	√H	-	√H
Lx/P_H	W/%	Lx active power harmonic in W or %	-	√H	-	√H
Lx/P_H1	W	Lx first active power harmonic	-	√H	-	√H
Lx/Q_H	var/%	Lx reactive power harmonic in W or %	-	√H	-	√H
Lx/Q_H1	var	Lx first reactive power harmonic	-	√H	-	√H

Note that channels named with Lx are added for each phase - Lx is replaced with L1, L2 and L3.

7. Formulas used for Aircraft Power AC outputs

The table below contains all formulas used for the module output results:

Standard		GJB 5558-2006
Item	**Physical quantity**	**AC formulas**
1	U_h AC voltage	$U_h = \sqrt{\frac{1}{m}\sum_{j=1}^{m} u_j^2}$ • U_h: The root-mean-square value of each half-wave voltage, in volts (V). • m: Total sampling times for each half wave (m≥90). • j: Sampling sequence/point, j = 1,2,3...m. • u_j: The instantaneous voltage value at the sampling point, in volts (V). • Sample rate no less than 72 kHz.
2	U Steady state AC voltage	$U = \sqrt{\frac{1}{T_w}\sum_{j=1}^{n} u_j^2 \Delta t}$ • U: Steady-state AC voltage, in volts (V). • T_w: The time corresponding to the largest integer number of voltage cycles which is no more than and closest to 1s, in seconds (s). • n: Total sampling times (n*△t ≈ T_w) • j: Sampling sequence/point, j=1,2,3...n. • u_j: The instantaneous voltage value at the sampling point, in volts (V). • △t: The time corresponding to each sample, in seconds (s). • Sample rate no less than 72 kHz.
3	U_ε Voltage unbalance	$U_\varepsilon = max\left[\left\|U_A - U_B\right\|, \left\|U_B - U_C\right\|, \left\|U_C - U_A\right\|\right]$ • U_ε: Three-phase voltage unbalance, the unit is volts (V). • U_A, U_B, U_C: Three-phase steady-state AC voltage. • Sample rate no less than 72 kHz.
		Formulas continue on the next page...

4	U_{TZ} Voltage modulation amplitude	$$U_{TZ} = max\left[U_{hAj,max} - U_{hAj,min}, U_{hBj,max} - U_{hBj,min}, U_{hCj,max} - U_{hCj,min}\right]$$ • U_{TZ}: Voltage modulation amplitude, the maximum value during the period corresponding to the largest integer number of voltage cycles, which is no more than and closest to 1s , in volts (V). • U_{hAj}, U_{hBj}, U_{hCj}: The root mean square value of each half-wave of each phase voltage; j = 1,2,3…n. • $U_{hAj,max}$, $U_{hAj,min}$: The maximum value and minimum value of U_{hAj} during a period corresponding to the largest integer number of voltage cycles, which is no more than and closest to 1 second. • $U_{hBj,max}$, $U_{hBj,min}$, $U_{hCj,max}$, $U_{hCj,min}$ are the same way. • Sample rate no less than 72 kHz.
5	θ Voltage phase difference	$$\theta = \frac{t_{\theta}}{T_{\theta}} \cdot 360°$$ • θ: Voltage phase difference (the electrical angle difference between the two phase voltage fundamental waves), in degree (°). • t_{θ}: The time interval between adjacent positive zero crossings of the fundamental wave of the two-phase voltage, in seconds (s). • T_{θ}: The time interval between adjacent positive zero crossings of the fundamental wave of the reference phase voltage, in seconds (s). Acquisition time of each phase: the time corresponding to the largest integer number of voltage cycles, which is no more than and closest to 1 s. The voltage phase difference of every two pairs of phase voltages in a three-phase voltage should be measured.
6	U_{JJ} k_{JJ} AC distortion factor	$$U_{JJ} = \sqrt{\frac{1}{T_W} \sum_{j=1}^{n} (u_{JJj})^2 \cdot \Delta t}$$ $$k_{JJ} = \frac{U_{JJ}}{U_1}$$ • T_W: The time corresponding to the largest integer number of voltage cycles, which is no more than and closest to 1 s, in seconds (s). • u_{JJj}: The instantaneous voltage value of the AC distortion waveform at the sampling point, in volts (V). • n: Total sampling times; • j: Sampling sequence, j = 1,2,3…n. • Δt: The time corresponding to each sample, in seconds (s). • k_{JJ}: AC voltage distortion factor; • U_{JJ}: AC voltage distortion, in volts (V). • U_1: The root mean square value of the fundamental voltage, in volts (V). • Sample rate no less than 1 MHz.

7	F_j Crest factor	$$F_j = \frac{\lvert U_{pj} \rvert}{U_{hj}}$$ • F_j: Crest factor. • U_{pj}: The peak voltage of each half wave, in volts (V). • Uhj: The root mean square value of the corresponding half-wave voltage, in volts (V). • Sample rate no less than 72 kHz. The maximum value of the obtained series of F_j during the period corresponding to the largest integer number of voltage cycles, which is no more than and closest to 1 s.
8	U_{JZ} DC component of the AC voltage	$$U_{JZ} = \frac{\sum_{j=1}^{n} u_j}{n}$$ • U_{JZ}: DC component of AC voltage, in volts (V); • u_j: The instantaneous voltage value at the sampling point, in volts (V). • j: Sampling sequence/point, j = 1,2,3...n. • n: The total sampling times during the period corresponding to the largest integer number of voltage cycles, which is no more than and closest to 1 s. • Sample rate no less than 72 kHz.
9	f Steady state frequency	$$f = \frac{N}{T_W}$$ • f: Steady-state frequency, in hertz (Hz). • N: Number of voltage cycles during T_W. • T_W: The time corresponding to the largest integer number of voltage cycles, which is no more than and closest to 1 s. • Sample rate no less than 72 kHz.
10	f_T Frequency modulation amplitude	$$f_T = f_{max} - f_{min}$$ • f_T: Frequency modulation amplitude, in Hertz (Hz). • f: The corresponding frequency calculated from taking the reciprocal of the period of each AC voltage cycle. • f_{max}: The maximum frequency within one minute. • f_{min}: The minimum frequency within one minute. • Sample rate no less than 200 kHz.

11	$cos(\varphi)$ Power factor	$$cos(\varphi) = \frac{1}{UIT_w}\sum_{j=1}^{n} u_j i_j \Delta t$$ • cos(φ) : Power factor (when the voltage and current are distorted, ϕ is not equal to the phase difference angle of u and i waveforms). • U : Steady-state AC voltage, in volts (V). • I : Steady-state AC current, the calculation method is the same as U, in ampere (A). • T_W : The time corresponding to the largest integer number of voltage cycles during the period which is no more than and closest to 1 s. • j : Sampling sequence, j = 1, 2, 3, ..., n. • u_j : Instantaneous voltage value, V. • i_j : Instantaneous current value, A. • Δt : The time corresponding to each sampling, in seconds.. • Sample rate no less than 72 kHz.
12	I_h AC Current	Alternating Current (AC) current is the RMS value for one half cycle measured between consecutive zero crossings of the fundamental frequency component. $$I_h = \sqrt{\frac{1}{m}\sum_{j=1}^{m} i_j^2}$$ • I_h : The root mean square value of each half-wave current, in Ampere (A). • m : Total sampling times for each half wave (m ≥ 90). • j : Sampling sequence/point, j = 1, 2, 3 ..., m. • i_j : The instantaneous current value at the sampling point, in Ampere (A). • Sample rate no less than 72 kHz.
13	I Steady state AC current	Please refer to the definition of Steady state AC voltage (table Item nr 2). $$I = \sqrt{\frac{1}{T_w}\sum_{j=1}^{n} i_j^2 \Delta t}$$ • I : Steady-state AC current, in Ampere (A). • T_W : The time corresponding to the largest integer number of current cycles, which is no more than and closest to 1 second. • n : Total sampling times ($n*\Delta t \approx T_W$) • j : Sampling sequence/point, j = 1, 2, 3 ..., n. • i_j : The instantaneous current value at the sampling point, in Ampere (A). • Δt : The time corresponding to each sample, in seconds. • Sample rate, no less than 72 kHz.

14	I_{TZP} AC Percent Current modulation	Current modulation is the difference between maximum current and minimum current. Percent current modulation is the ratio of the current modulation to the average (mean for DC, RMS of the fundamental for AC) current multiplied by 100 over a one second period. $$I_{TZP} = max(\frac{I_{hj,max} - I_{hj,min}}{I_j}) * 100$$ • I_{TZP} : AC Percent Current modulation amplitude. • I_{hj} : The root mean square value of each half-wave of each phase current, j = 1, 2, 3 ..., n. • $I_{hj,max}$, $I_{hj,min}$: The maximum value and minimum value of the I_{hj} during a period corresponding to the largest integer number of current cycles, which is no more than and closest to 1 s. • I : Steady state AC current of each phase, j = 1, 2, 3 ..., n. • Sample rate no less than 72 kHz.
14.1	I_{TZ} AC Current modulation amplitude	Current modulation is the difference between maximum current and minimum current. $$I_{TZ} = max(I_{hj,max} - I_{hj,min})$$ • I_{TZ} : AC Current modulation amplitude. • I_{hj} : The root mean square value of each half-wave of each phase current, j = 1, 2, 3 ..., n. • $I_{hj,max}$, $I_{hj,min}$: The maximum value and minimum value of the I_{hj} during a period corresponding to the largest integer number of current cycles, which is no more than and closest to 1 s. • Sample rate no less than 72 kHz.
		Formulas continue on the next page...

<table>
<tr>
<td>15</td>
<td>I_{JJ}
KI_{JJ}
AC Current distortion factor</td>
<td>AC distortion is the RMS value of the AC waveform excluding (without) the fundamental.
The AC distortion factor is the ratio of the AC distortion to the RMS value of the fundamental component.
$$I_{JJ} = \sqrt{\frac{1}{T_W}\sum_{j=1}^{n}(i_{JJj})^2 \cdot \Delta t}$$
$$KI_{JJ} = \frac{I_{JJ}}{I_1}$$
• I_{JJ} : AC current distortion, in Ampere (A).
• T_W : The time corresponding to the largest integer number of current cycles, which is no more than and closest to 1 s.
• i_{JJj} : The instantaneous current value of the AC distortion waveform at the sampling point, in Ampere (A).
• n : Total sampling times.
• j : Sampling sequence, j = 1, 2, 3 ..., n.
• Δt : The time corresponding to each sample, in seconds.
• Ik_{JJ} : AC current distortion factor.
• I_1 : The root mean square value of the fundamental current, in Ampere (A).
• Sample rate no less than 1 MHz.</td>
</tr>
</table>

8. Add and set-up Aircraft Power DC

8.1. Add Aircraft Power DC module to a setup configuration

The Aircraft Power DC math module can be added to the setup under the Math section by clicking on the Add math (+) button and then selecting the Aircraft Power DC math module located under the Electrical measurements section:

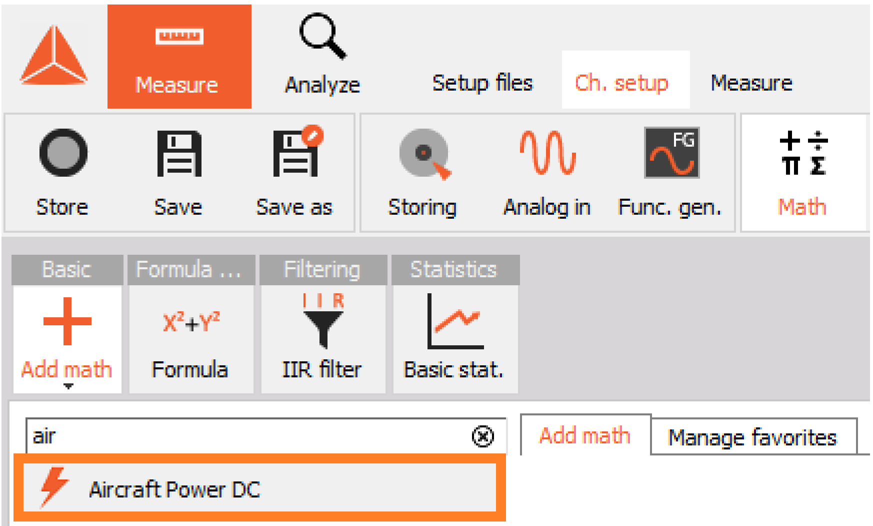
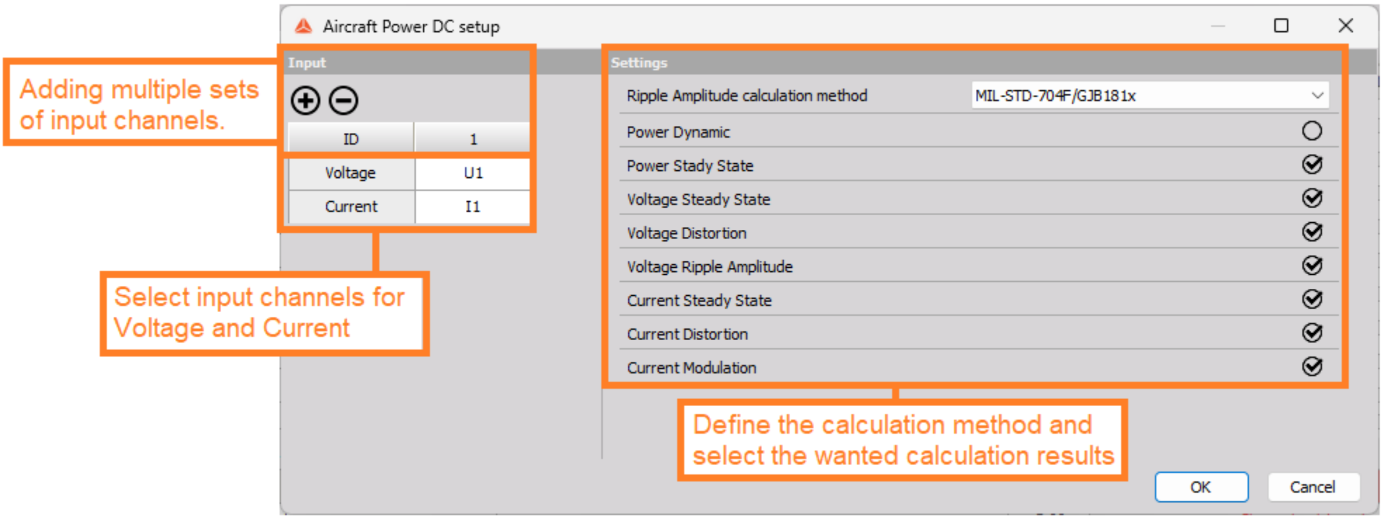


Illustration of how to add the Aircraft Power DC math module to a setup.

8.2. Settings for Aircraft Power DC

An overview of the module setup page is shown below:



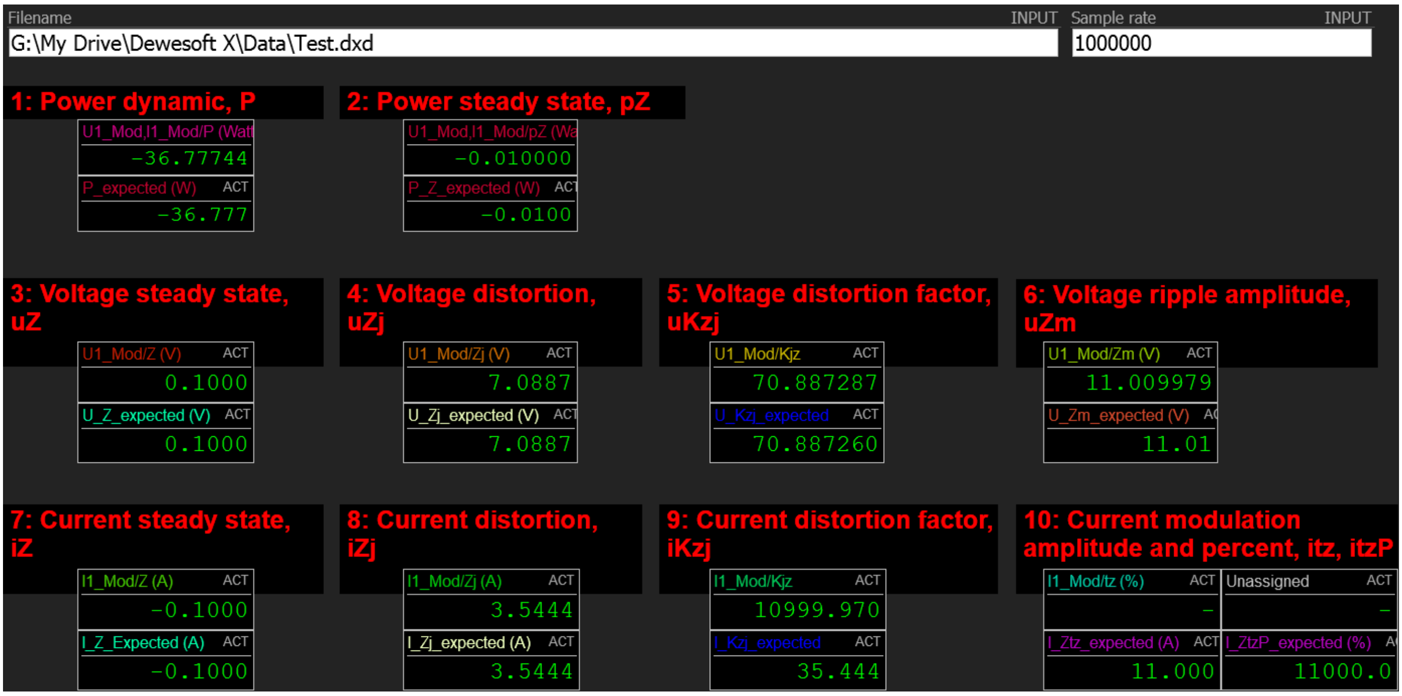
The first step after adding the Aircraft Power DC module is to define the input channel for Voltage and Current. Multiple sets of input Voltage and Current channels can be calculated in parallel by pressing the (+) button.

NOTE: Make sure the unit for voltage is "V" and the unit for current is "A" to get correct output results in "Watt".

Under the Settings section first select the calculation method according to the desired standards, and then select the wanted calculated output results.

9. Measuring and visualization of Aircraft Power DC

After completing the configuration of the module, the calculated output data can be monitored while measuring by going to the Measure tab, as illustrated below:



An example of how data results can be illustrated in Measure mode. The display can be modified as desired by the user.

In Measure mode the acquired and calculated aircraft data can be displayed in multiple different display widget, which can be selected under the tab

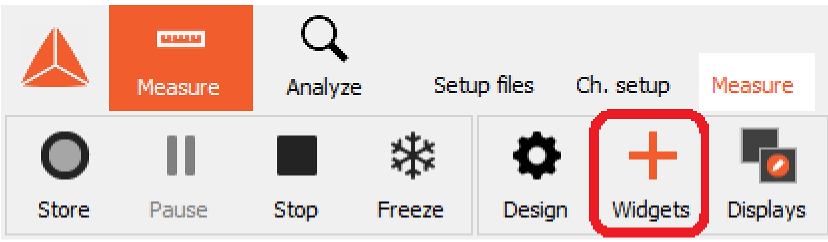


Illustration of how to add visual widgets to a Measure display.

10. Channel output overview for Aircraft Power DC

Depending on the settings, different results are calculated and stored. The list below gives an overview of all possible channels.

Ch Name	Unit	Description
UDC,IDC/P	Watt	Power Dynamic
UDC,IDC/pZ	Watt	Power Steady State
UDC/Z	V	Voltage Steady State
UDC/Zj	V	Voltage distortion amplitude
UDC/Kjz	-	Voltage distortion factor
UDC/Zm *1)	V	Voltage ripple amplitude
IDC/Z	A	Current Steady State
IDC/Zj	A	Current distortion amplitude
IDC/Kjz	-	Current distortion factor
IDC/tz	%	Current modulation

Referring to *1) - The Voltage ripple calculation method depends on the selected standard.

Note that the names UDC and IDC are replaced with the selected input channel names.

11. Formulas used for Aircraft Power DC outputs

The table below contains all formulas used for the module output results:

Standard		GJB 5558-2006
Item	**Physical quantity**	**DC formulas**
1	U_Z Steady state DC voltage	$$U_Z = \frac{1}{n}\sum_{j=1}^{n} u_{Zj}$$ • U_Z: Steady-state DC voltage, in volts (V). • u_{Zj}: The instantaneous voltage value at the DC voltage sampling point, in volts (V). • j : Sampling sequence/point, j = 1, 2, 3 ..., n. • n : The total sampling times during the period which is closest to or equals to 1 s. • Sample rate no less than 72 kHz.
2	U_{ZJ} K_{ZJ} DC distortion factor	$$U_{ZJ} = \sqrt{\frac{1}{T}\sum_{j=1}^{n} (u_{ZJj})^2 \cdot \Delta t}$$ $$K_{ZJ} = \left\lvert \frac{U_{ZJ}}{U_Z} \right\rvert$$ • U_{ZJ} : DC voltage distortion, the unit is volts (V). • K_{ZJ} : DC voltage distortion factor. • U_Z : Steady-state DC voltage, in volts (V). • T : Acquisition time is closest to or equals to 1 second. • u_{ZJj} : The instantaneous voltage value of the DC voltage distortion waveform at the sampling point, in volts (V). • n : Total sampling times. • j : Sampling sequence/point, j = 1, 2, 3 ..., n. • Δt : The time corresponding to each sample, in seconds. • Sample rate no less than 1 MHz.
3	U_{ZM} DC Voltage ripple amplitude	$$U_{ZM} = max\left[U_{Zmax} - U_Z, U_Z - U_{Zmin}\right]$$ • U_{ZM} : DC voltage ripple amplitude, in volts (V); • UZ_{max}, UZ_{min} : the maximum and minimum instantaneous value of the DC voltage in the steady state, which are calculated during the period which is closest or equal to 1 s. • U_z : Steady-state DC voltage. • Sample rate no less than 200 kHz.

4	I_Z Steady state DC current (IDC/Z)	Please refer to the definition of Steady state DC voltage (table Item nr 1). $$I_Z = \frac{1}{n}\sum_{j=1}^{n} i_{Zj}$$ • I_Z : Steady state DC current, in Ampere (A). • i_{Zj} : The instantaneous current value at the sampling point, in Ampere (A). • j : Sampling sequence/point, j = 1, 2, 3 ..., n. • n : The total sampling times during the period which is closest or equals to 1 s. • Sample rate no less than 72 kHz.
5	I_{ZJ} KI_{ZJ} DC current distortion factor (IDC/Kzj)	$$I_{ZJ} = \sqrt{\frac{1}{T}\sum_{j=1}^{n} (i_{ZJj})^2 \cdot \Delta t}$$ $$KI_{ZJ} = \left\| \frac{I_{ZJ}}{I_Z} \right\|$$ • I_{ZJ} : DC current distortion, the unit is Ampere (A). • KI_{ZJ} : DC current distortion factor. • I_Z : Steady-state DC current, in Ampere (A). • T : Acquisition time is closest to or equals to 1 second. • i_{ZJj} : The instantaneous current value of the DC current distortion waveform at the sampling point, in Ampere (A). • n : Total sampling times. • j : Sampling sequence/point, j = 1, 2, 3 ..., n. • Δt : The time corresponding to each sample, in seconds (s). • Sample rate no less than 1 MHz.
6	I_{ZTZ} DC Current modulation amplitude (IDC/tz)	Current modulation is the difference between maximum current and minimum current. Percent current modulation is the ratio of the current modulation to the average (mean for DC, RMS of the fundamental for AC) current multiplied by 100, over a one second period. $$I_{ZTZ} = \left\| \frac{i_{Zj,max} - i_{Zj,min}}{I_Z} \right\| * 100$$ • I_{ZTZ} : DC Current modulation amplitude. • i_{Zj} : The instantaneous current value at the sampling point, in Ampere (A). • j : sampling point, j = 1, 2, 3 ..., n. • $i_{Zj,max}$, $i_{Zj,min}$: The maximum value and minimum value of the i_{Zj} during a period which is closest or equal to 1 s. • I_Z : Steady state DC current. • Sample rate no less than 72 kHz.

12. Warranty information

Notice
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The copy of the specific warranty terms applicable to your Dewesoft product and replacement parts can be obtained from your local sales and service office. To find a local dealer for your country, please visit https://dewesoft.com/support/distributors.

12.1. Calibration

Every instrument needs to be calibrated at regular intervals. The standard norm across nearly every industry is annual calibration. Before your Dewesoft data acquisition system is delivered, it is calibrated. Detailed calibration reports for your Dewesoft system can be requested. We retain them for at least one year, after system delivery.

12.2. Support

Dewesoft has a team of people ready to assist you if you have any questions or any technical difficulties regarding the system. For any support please contact your local distributor first or Dewesoft directly.

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1420 Trbovlje Slovenia

Europe Tel.: +386 356 25 300
Web: http://www.dewesoft.com
Email: Support@dewesoft.com
The telephone hotline is available Monday to Friday from 07:00 to 16:00 CET (GMT +1:00)

12.3. Service/repair

The team of Dewesoft also performs any kinds of repairs to your system to assure a safe and proper operation in the future. For information regarding service and repairs please contact your local distributor first or Dewesoft directly on https://dewesoft.com/support/rma-service.

12.4. Restricted Rights

Use Slovenian law for duplication or disclosure. Dewesoft d.o.o. Gabrsko 11a, 1420 Trbovlje, Slovenia / Europe.

12.5. Printing History

Version 2.0.0, Revision 217 Released 2015 Last changed: 23. July 2018 at 16:54.

12.6. Copyright

12.7. Trademarks

We take pride in our products and we take care that all key products and technologies are registered as trademarks all over the world. The Dewesoft name is a registered trademark. Product families (KRYPTON, SIRIUS, DSI, DS-NET) and technologies (DualCoreADC, SuperCounter, GrandView) are registered trademarks as well. When used as the logo or as part of any graphic material, the registered trademark sign is used as a part of the logo. When used in text representing the company, product or technology name, the ® sign is not used. The Dewesoft triangle logo is a registered trademark but the ® sign is not used in the visual representation of the triangle logo.

13. Safety instructions

Your safety is our primary concern! Please be safe!

13.1. Safety symbols in the manual

Warning

Calls attention to a procedure, practice, or condition that could cause the body injury or death

Caution

Calls attention to a procedure, practice, or condition that could possibly cause damage to equipment or permanent loss of data.

13.2. General Safety Instructions

Warning

The following general safety precautions must be observed during all phases of operation, service, and repair of this product. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the product. Dewesoft d.o.o. assumes no liability for the customer's failure to comply with these requirements.

All accessories shown in this document are available as an option and will not be shipped as standard parts.

13.2.1. Environmental Considerations

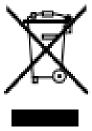
Information about the environmental impact of the product.

13.2.2. Product End-of-Life Handling

Observe the following guidelines when recycling a Dewesoft system:

13.2.3. System and Components Recycling

Production of these components required the extraction and use of natural resources. The substances contained in the system could be harmful to your health and to the environment if the system is improperly handled at its end of life! Please recycle this product in an appropriate way to avoid unnecessary pollution of the environment and to keep natural resources.



This symbol indicates that this system complies with the European Union's requirements according to Directive 2002/96/EC on waste electrical and electronic equipment (WEEE). Please find further information about recycling on the Dewesoft web site www.dewesoft.com

Restriction of Hazardous Substances
This product has been classified as Monitoring and Control equipment and is outside the scope of the 2002/95/EC RoHS Directive. However, we take care of our environment and the product is lead-free.

13.2.4. General safety and hazard warnings for all Dewesoft systems

Safety of the operator and the unit depend on following these rules.

- Use this system under the terms of the specifications only to avoid any possible danger.
- Read your manual before operating the system.
- Observe local laws when using the instrument.
- DO NOT touch internal wiring!
- DO NOT use higher supply voltage than specified!
- Use only original plugs and cables for harnessing.
- You may not connect higher voltages than rated to any connectors.
- The power cable and connector serve as Power-Breaker. The cable must not exceed 3 meters, the disconnect function must be possible without tools.
- Maintenance must be executed by qualified staff only.
- During the use of the system, it might be possible to access other parts of a more comprehensive system. Please read and follow the safety instructions provided in the manuals of all other components regarding warning and security advice for using the system.
- With this product, only use the power cable delivered or defined for the host country.
- DO NOT connect or disconnect sensors, probes or test leads, as these parts are connected to a voltage supply unit.
- Ground the equipment: For Safety Class 1 equipment (equipment having a protective earth terminal), a non-interruptible safety earth ground must be provided from the mains power source to the product input wiring terminals.
- Please note the characteristics and indicators on the system to avoid fire or electric shocks. Before connecting the system, please read the corresponding specifications in the product manual carefully.

- The inputs must not, unless otherwise noted (CATx identification), be connected to the main circuit of category II, III and IV.
- The power cord separates the system from the power supply. Do not block the power cord, since it has to be accessible for the users.
- DO NOT use the system if equipment covers or shields are removed.
- If you assume the system is damaged, get it examined by authorized personnel only.
- Adverse environmental conditions are Moisture or high humidity Dust, flammable gases, fumes or dissolver Thunderstorm or thunderstorm conditions (except assembly PNA) Electrostatic fields, etc.
- The measurement category can be adjusted depending on module configuration.
- Any other use than described above may damage your system and is attended with dangers like short-circuiting, fire or electric shocks.
- The whole system must not be changed, rebuilt or opened.
- DO NOT operate damaged equipment: Whenever it is possible that the safety protection features built into this product have been impaired, either through physical damage, excessive moisture, or any other reason, REMOVE POWER and do not use the product until the safe operation can be verified by service-trained personnel. If necessary, return the product to Dewesoft sales and service office for service and repair to ensure that safety features are maintained.
- If you assume a more riskless use is not provided anymore, the system has to be rendered inoperative and should be protected against inadvertent operation. It is assumed that a more riskless operation is not possible anymore if the system is damaged obviously or causes strange noises. The system does not work anymore. The system has been exposed to long storage in adverse environments. The system has been exposed to heavy shipment strain.
- Warranty void if damages caused by disregarding this manual. For consequential damages, NO liability will be assumed!
- Warranty void if damage to property or persons caused by improper use or disregarding the safety instructions.
- Unauthorized changing or rebuilding the system is prohibited due to safety and permission reasons (CE).
- Be careful with voltages >25 VAC or >35 VDC! These voltages are already high enough in order to get a perilous electric shock by touching the wiring.
- The product heats during operation. Make sure there is adequate ventilation. Ventilation slots must not be covered!
- Only fuses of the specified type and nominal current may be used. The use of patched fuses is prohibited.
- Prevent using metal bare wires! Risk of short circuit and fire hazard!
- DO NOT use the system before, during or shortly after a thunderstorm (risk of lightning and high energy over-voltage). An advanced range of application under certain conditions is allowed with therefore designed products only. For details please refer to the specifications.
- Make sure that your hands, shoes, clothes, the floor, the system or measuring leads, integrated circuits and so on, are dry.
- DO NOT use the system in rooms with flammable gases, fumes or dust or in adverse environmental conditions.
- Avoid operation in the immediate vicinity of high magnetic or electromagnetic fields, transmitting antennas or high-frequency generators, for exact values please refer to enclosed specifications.
- Use measurement leads or measurement accessories aligned with the specification of the system only. Fire hazard in case of overload!

- Lithium ion batteries are classified as not hazardous when used according to the recommendations of the manufacturer described in Battery Safety Data Sheet, which is available for download from this link.
- Do not switch on the system after transporting it from a cold into a warm room and vice versa. The thereby created condensation may damage your system. Acclimatize the system unpowered to room temperature.
- Do not disassemble the system! There is a high risk of getting a perilous electric shock. Capacitors still might be charged, even if the system has been removed from the power supply.
- The electrical installations and equipment in industrial facilities must be observed by the security regulations and insurance institutions.
- The use of the measuring system in schools and other training facilities must be observed by skilled personnel.
- The measuring systems are not designed for use in humans and animals.
- Please contact a professional if you have doubts about the method of operation, safety or the connection of the system.
- Please be careful with the product. Shocks, hits and dropping it from already- lower level may damage your system.
- Please also consider the detailed technical reference manual as well as the security advice of the connected systems.
- This product has left the factory in safety-related flawlessness and in proper condition. In order to maintain this condition and guarantee safety use, the user has to consider the security advice and warnings in this manual.

EN 61326-3-1:2008
IEC 61326-1 applies to this part of IEC 61326 but is limited to systems and equipment for industrial applications intended to perform safety functions as defined in IEC 61508 with SIL 1-3.

The electromagnetic environments encompassed by this product family standard are industrial, both indoor and outdoor, as described for industrial locations in IEC 61000-6-2 or defined in 3.7 of IEC 61326-1.

Equipment and systems intended for use in other electromagnetic environments, for example, in the process industry or in environments with potentially explosive atmospheres, are excluded from the scope of this product family standard, IEC 61326-3-1.

Devices and systems according to IEC 61508 or IEC 61511 which are considered as “operationally well-tried”, are excluded from the scope of IEC 61326-3-1.

Fire-alarm and safety-alarm systems, intended for the protection of buildings, are excluded from the scope of IEC 61326-3-1.

14. Documentation version history

Version	Date	Notes
V23-1	2023-02-27	The manual is created.