Power Analyser
DEWESoft® Power Analyzer

… INNOVATIVE POWER ANALYSIS NEVER EXPERIENCED BEFORE

**HARDWARE**

- **HIGH SAMPLING RATE**
  1 MS/s

- **HIGH BANDWIDTH**
  2 MHz

- **HIGH ACCURACY**
  0.05 %
  Additional software calibration for current transducers

- **VOLTAGE INPUTS**
  Up to 1600V DC
  CAT II 1000V / CAT III 600 V

**SOFTWARE**

- **POWER ANALYZER**
  P, Q, S, PF, cos φ, …
  more than 100 calculated values

- **OSCILLOSCOPE**
  Scope and Vector Scope

- **FFT & POWER QUALITY**
  FFT, Harmonics FFT, Interharmonics, Higher Frequencies, Flicker, Flicker emission etc.

**TRANSIENT RECORDING**

- Triggering on analogue, math or power channels

**RECORDE R/ DATA LOGGER**

- Raw data storing in full sampling rate

**POST PROCESSING**

- Powerful analysis after measurement

**MOBILE MEASUREMENT SYSTEM**

- Hot-Swapable battery pack
  Sensor supply out of the device

**ANALOG INPUTS**

- Up to 64 analogue inputs
  8 x three phase systems

**ADDITIONAL INPUTS**

- Analogue, digital, counter, GPS, CAN, video, etc.
DEWESoft® Power Analyzer

... SOLUTION FOR EVERY APPLICATION

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DEWESoft® Power Analyzer

... SOLUTION FOR EVERY APPLICATION

- SIRIUSi
- R2DB
- R8D
- BATTERY PACK
- SENSOR SUPPLY
- CURRENT TRANSUDCERS

**64 Channel Power Analyser**
- 64x analogue inputs
- 8x Three phase systems
- 1 MS/s Sampling Rate
- 2 MHz Bandwidth
- 0.05 % Accuracy
- Voltage up to 1600 VDC

**8 Channel Power Analyser**
- 8x analogue inputs
- 4x Three phase systems
- 1 MS/s Sampling Rate
- 2 MHz Bandwidth
- 0.05 % Accuracy
- Voltage up to 1600 VDC

**16 Channel Power Analyser**
- 16x analogue inputs
- 2x Three phase systems
- 1 MS/s Sampling Rate
- 2 MHz Bandwidth
- 0.05 % Accuracy
- Voltage up to 1600 VDC

**Hot Swappable Battery Pack**
- Up to 384 Wh capacity
- Up to 250 W power
- Status display
- Wrong polarity protection

**Power Supply for sensors**
- Directly out of the device
- 2 to 30 V bipolar / 0 to 24 V unipolar, SW programmable (16 bit DAC)
- Connection of any current transducer possible

**Current Measurement**
- Connection of any current transducer possible
- Automatic Sensor Detection
- High Precision Zero Flux Transducer
- Hall compensated AC / DC clamps
- Rogowsky Coils
- Iron core Clamps

**CUSTOMIZATION**
- From customizing the front connector to fit to your sensors, up to implementing software / application features.

**TRAINING**
- In-house or in your company, on every topic, according to your needs.

**SERVICE & SUPPORT**
- Call our team of experienced engineers to help you with your questions related to specific measurement applications.

**TOTAL CARE**
- Maintenance package, Service Centers worldwide for annual ISO calibration.
Power Analysis

Different wiring schematics allow the power calculation for all possible connections. These are single phase, star connection, delta connection, V connection, Y connection and a combined star / delta connection. All of course with or without currents. It’s even possible to analyse 6-, 7-, 9- or 12-phase motors due to the combination of powerful hard- and software.

It is possible to do a number of power analysis within just one device. For example with the Dewesoft R&D you can measure 8 three phase systems completely synchronous. Furthermore it is possible to do the analysis for different frequencies (DC, 50Hz, variable frequency etc.) and wiring schematics (1 phase, 3 phase etc.).

POWER ANALYSIS

OSCILLOSCOPE

FFT & POWER QUALITY

RECORER / DATA LOGGER

TRANSIENT RECORDING

ANALYSIS, EXPORT & POST PROCESSING

STAR – DELTA CALCULATION

It is possible to calculate out of a delta connection all values and the waveform for the star connection and vice versa.

Waveform: U1, U2, U3 -> U12, U23, U31

P, Q, S, D
Cos φ, power factor
P, Q, cos φ for each harmonic

MULTIPLE POWER CALCULATIONS

Inverter
Motor
Break / Load
3-Phase AC

3-Phase AC

Input
Output

It is possible to do a number of power analysis within just one device. For example with the Dewesoft R&D you can measure 8 three phase systems completely synchronous. Furthermore it is possible to do the analysis for different frequencies (DC, 50Hz, variable frequency etc.) and wiring schematics (1 phase, 3 phase etc.).
**FREQUENCY CALCULATION**

The software PLL guarantees a very accurate frequency calculation (mHz). On one system multiple power systems can be measured and each can have its own frequency. With the use of different instruments from DEWESoft® the values can be shown in several ways.

Possible frequency ranges:
- 16.7 Hz: Railway Sector
- 50 Hz: Public Grid
- 60 Hz: Public Grid
- 400 Hz: Aerospace
- 800 Hz: Aerospace
- Variable frequency: Inverter (from 0.5 Hz to 3 kHz)

**FREQUENCY SOURCE**

In Dewesoft you can choose whether you use the voltage, current, or an external source as frequency source. This is a very helpful feature especially at inverter measurements. Due to the PWM modulated voltage signal the correct period time often cannot be determined right. The current is much less distorted because of the high inductance of the motor coil. Therefore it is often better to use the current as frequency source at inverter measurements. This feature ensures correct frequency determination for every application.

**SCOPE**

- Selectable graphs
- U1, U2, U3, U12, U23, U13: Line to line and line to earth voltages are supported
- Up to 8 graphs in one diagram
- Zoom in and out are supported online
- Waveforms can be stored

**PERIOD VALUES**

- U, I, P, Q, S, PF for each phase and total
- Symmetrical Components (U, I, P, Q for positive-, negative- and zero-sequence system)
- Definable cycle calculation (1/2, 1, 2 or 4 cycles)
- Overlap of up to 99% (1ms sliding)

**VECTOR SCOPE**

- Vector scope for 3 phase systems
- Each individual harmonic can be shown
- More vector scopes can be displayed on one screen
- Different power systems can be shown on one screen
- With the “transparent” function direct comparisons of phasors are possible

**RAW DATA STORING**

With a very specific data file structure we can write the channel setup, display setup, all the events, fast analog data and slow asynchronous data from different sources in a single file. For long-term measurement DEWESoft® offers to roll-over the file automatically when certain file size is reached or after a specified time (for example after 24 hours the current file is closed and a new one is created automatically). DEWESoft® makes sure that no data is lost during the file roll-over.

**RECORDING**

- Recording of all parameters in individual intervals
- Individual screens can be defined
- Zoom in and out
- Storing fast (full sampling rate) or reduced (e.g. 600 sec.)
- Detailed zoom-in to pulse width

**X/Y RECORDER**

- Graphs can be generated online
- P over Q as example for this function

**RECORDING**

- Trigger on all channels possible (analog, digital, power, math, etc.)
- Setting a trigger on all parameters of the power module
- U, I, P, Q, S, cos φ, power factor, ...
- Each harmonic
- Pos-, neg-, zero-sequence systems
- Very fast glitch detection (up to MS/s)
- Math. channels (rpm, torque, efficiency, …)

**CALIBRATION/Accuracy**

Voltage and Current transducers always have a frequency dependent amplitude error and phase shift. With Dewesoft’s unique software calibration technology amplitude and phase can be corrected for the full frequency range from DC up to 1 MHz. All internal curves like filter response are corrected inside the software and the sensor database includes correction curves for each clamp, Rogowski coil, transformer or which sensor ever is used.
Power Quality Analysis

**FFT - Harmonics Analysis**
- U, I, P, Q and impedance
- Individual setup of the number of harmonics including DC component (Example: 20 kHz sampling rate = 200 harmonics @ 50 Hz)
- Harmonics in 1000th order
- Variable subbands / half subbands for Harmonics
- Higher frequencies up to 150 kHz in 200 Hz bands
- Interharmonics, groups or single values
- According to EN 61000-4-7
- Calculation corrected to the actual real frequency
- THD, THD even, THD odd
- Trigger on each parameter
- Background harmonics subtractable

**Full FFT - Frequency Analysis**
- In addition to the harmonics FFT a full frequency based FFT is available.
- All frequencies can be analyzed with this function
- Trigger on FFT patterns
- Definable filters (hanning, haming, flat top, rectangle, ...)

**Symmetrical Components**
- U, I, P, Q, S
- Positive-, Negative- and Zero sequence system
- Period Values
- Unbalance related to fundamental part or total spectrum
- More than 50 different parameters

**Flicker & Flicker Emission**
- According to EN 61000-4-15
- PST and PFT with flexible intervals
- Individual resampling intervals
- Period, du, dmax, duration
- Flicker emission (current flicker)

**Rapid Voltage Changes**
- According to EN 61000-4-15
- Duv, dmax and duration

Interfaces

**Video Input**
For applications requiring video which is truly synchronized to the dynamic sample rate, there is support for DS-Cameras. A high quality image with automatic shutter speed (selectable) is controlled directly by the A/D card, which generates a pulse to drive the camera. The result is a stunning correlation between each frame and the data. Thermo cameras are supported from FLIR, NEC and MICRON, and high speed cameras from Photron which can acquire more than 100000 frames per second.

**Vehicle Bus Interfaces**
One of the most important vehicle buses today is the CAN (controller area network) bus. DEWESoft® X supports following CAN devices: DEWE-43A, DS-NET, DS-CAN-2 and SIRIUS. Today the CAN bus is present in cars, trucks, boats, tanks, tractors, harvesters and basically anything which has a modern engine built in.

**GPS Interfaces**
GPS technology is used in three main application areas: to find the position on earth, to determine the velocity of an object and to get precise absolute time information. DEWESoft® X uses all three areas. For basic positioning, DEWESoft® supports NMEA GPS interfaces. If you have a GPS receiver which sends the data according to NMEA specification, it will work in DEWESoft® up to a real-time rate of 500 Hz.

**Counter Inputs**
The so called super-counters (DEWE-43A, SIRIUS, etc…) allow a very precise timing and counting measurement. The counting is performed on an internal 102.4 MHz time base, no matter which sampling rate is currently used.
Math Library

**DATA PROCESSING CAPABILITIES**

Even though the main focus of DEWESoft® is on data acquisition and storage, it also offers powerful analysis features. The powerful math library covers a couple of functions which makes data analysis directly in DEWESoft and even direct during measurement possible. Imagine you have a big data file of a long-term battery test. With the formula mathematics you can define logical conditions (e.g. if current > 10A AND temperature > 70°C) to quickly find the positions you are interested in. By the way, it’s also possible to exclude faulty data points, such as spikes, just by defining logical conditions. Furthermore, often used functions like delta time measurement between two signal edges, counting how often conditions appear, or holding the signal value on a condition and many more are already prepared. Use the complex section to split a signal into real and imaginary part, while the array section is used e.g. to cut arrays or determine min/max and their positions.

**MATH FEATURES**

- Filtering (FIR, IIR, FFT filter, integration, derivation, …)
- Logical conditions
- Basic Statistics (RMS, AVG, Min, Max, …)
- Advanced Statistics (Std deviation, variance, classification, counting …)
- Reference curve (time, XY and frequency domain)
- Converting time-based to angle-based domain (resampling)
- Envelope function
- Delay channel (previous value, delta-calculation)
- Latching (hold value on certain conditions)
- Angle sensor math (convert analog input signal from tacho probe to freq. + angle)
- Scope trigger
- Spectral Analysis (FFT, STFT, CPW, SineProcessing)

***FILTERING***

**Frequency Domain**

- Digital Butterworth filters
- Digital Chebyshev filters
- Digital Elliptic filters
- Digital Bessel filters
- Digital Cauer filters

**Time Domain**

- Gain
- Offset
- Delay
- Latching
- Scope trigger
- Enclosed curve

**Spectral Domain**

- FFT
- STFT
- CPW

**Data Processing**

- RMS
- AVG
- Min
- Max

**Statistics**

- Standard deviation
- Variance
- Classification
- Counting

**Reference Curves**

- Time
- XY
- Frequency domain

**Resampling**

- From time-based to angle-based domain

**Signal Math**

- Envelope function
- Delay channel
- Latching
- Scope trigger
- Spectral Analysis

**ANALYZE & PUBLISH**

**POST PROCESSING**

Post processing is a unique feature of Dewesoft which allows to do all analysis and mathematics after the measurement for already stored data. It’s even possible to change measurement settings. Post processing the data files is possible on any computer, without any license.

**FILE PREVIEW - ANALYSIS MODE**

The file preview of DEWESoft is completely free of charge. DEWESoft can be downloaded and used for file preview on any PC without any cost or license.

**REPLAY**

To get an impression how the measurement was done, especially when we have video streams in the measured file, DEWESoft® offers file replay capabilities. We can choose a specific portion in the file and replay the data with the same speed as it was stored or with higher/lower speed. For example, it is very interesting to view high speed videos in slow-motion. DEWESoft® does not only show the data, but it can also replay the data through sound card. Any channel can be chosen for replay through speakers. DEWESoft® can also replay data of any channels through SIRIUS AO8 option.

One of the most outstanding features of DEWESoft is that data files, even if they are several gigabytes in size, are loaded in a matter of seconds. A special data structure allows fast reloads and zooming. You can select any part of the data in the recorder and zoom in to show all the interesting details.

**EXPORT DATA**

Since the main focus of DEWESoft® is on data acquisition and storage, it has extensive support for exporting the data to other file formats for post processing. You can choose different export file types, use scripting for direct reporting and export raw, reduced or angle based data. DEWESoft® offers templates with Flexpro, MS Excel®, and Famos. These templates allow you to prepare the reports once and execute them after DEWESoft® data export. In this way you can automate report generation and simplify the measurement process. Alternatively you can export your measurement screen to AVI. This allows to replay the file with every standard video player without the need of installing DEWESoft®.

Supported data formats are:

- Microsoft Excel®
- Flexpro®
- Text
- ASCII
- MATLAB®
- Scilab®
- UNV
- BWF
- Sony®
- ATV
- ATI
- RPC III
- Comtrade®
- Google Earth®
- TDF
- KML
- and more...

* export only possible if the program is installed on the measurement PC

**REPORTS**

When you are reviewing data in the analyze mode, you can make hard copies as easily as clicking the Print button in the top toolbar. Any display can be directly printed to PDF or printer. Even if we have black background as default, DEWESoft® will invert the colors to be printer friendly. Even the channel setup can be printed for documentation purposes.
Motor Testing

Motors have to fulfill higher and higher requirements concerning energy efficiency. Since 2011 all asynchronous motors have to be at least level IE2 according to the IEC 60034. Before this standard was established losses were considered with 0.5%. Now they have to be determined. The efficiency and losses determination of motors requires highest accuracy of the whole measurement chain. The Dewesoft Power Analyzer and the possibility of the additional software sensor calibration guarantee highest accurate measurement results, which are necessary for the efficiency and losses determination. The modular hardware concept allows measuring 1 to 12-phase motors as well as the mechanical parameters (speed, torque). It’s also possible to measure additional parameters like vibration, sound-level, temperature etc. Power Quality analysis (Fundamental Power, Harmonics, THD, etc.) complements the analysis capabilities.

HIGHLIGHTS
- Efficiency and losses determination
- Analysis of 1-12 phase motors
- Additional sensor calibration
- Measurement of mechanical and additional parameters

The equivalent circuit of an asynchronous motor can be determined out of the no-load and short-circuit measurements.

TYPICAL CONFIGURATION
- Dewesoft R2D
  4x Voltage
  4x Current
  1x Torque
  1x Speed
  Sound-Level, Vibration
Inverter Testing

The Dewesoft Power Analyzer allows comprehensive and high accurate analysis for all kind of inverters. The combination of modular, highly accurate hardware and powerful software allows measuring all in- and output configurations (up to 7-phase AC systems). Fundamental frequencies from 0.5 Hz up to 3 kHz can be analysed as well as switching frequencies up to some hundred kHz. The analysis possibilities reach from efficiency determination to detailed analysis of each switching pulse. Helpful software functionalities therefore are the raw data storing, transient recording, the Power Quality library and the Math library. The raw data storing allows analysis and presentation of each individual switching pulse (e.g. transient behavior in scope). The power quality library automatically calculates THD, harmonics etc. The transient recording allows capturing voltage peaks (e.g. at long cable lengths) or capturing current peaks which can be a multiple of the nominal current.

High edge steepness of the inverter output (up to 10kV/µs) can also create capacitive leakage currents or high motor bearing currents (due to the parasitic motor- and line capacitances). All this factors can harm the motor and often make the usage of filters necessary. Not only is the Dewesoft Power Analyzer capable of measuring all this parameters, it is also possible to analyses everything during measurement. Via the math library for example the voltage steepness (dU/dt) of every impulse can be determined and statistically classified. This analysis possibility makes the design and testing of inverters and filters exceptionally easier.

HIGHLIGHTS
- Efficiency analysis
- Raw data analysis
- Voltage rise time analysis (dU/dt)
- Transient recording
- Filter analysis

<table>
<thead>
<tr>
<th>TYPE OF INVERTER</th>
<th>INPUT</th>
<th>OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry Inverter</td>
<td>1 to 3~ AC</td>
<td>3~ AC</td>
</tr>
<tr>
<td>Electric Vehicle Inverter</td>
<td>DC</td>
<td>3~ AC</td>
</tr>
<tr>
<td>Photovoltaic Inverter</td>
<td>DC</td>
<td>1 to 3~ AC</td>
</tr>
<tr>
<td>Wind Power Inverter</td>
<td>3~ AC</td>
<td>3~ AC</td>
</tr>
<tr>
<td>Electric Two-Wheeler</td>
<td>DC</td>
<td>1 to 7~ AC</td>
</tr>
</tbody>
</table>

Motor and Inverter Testing

Combined motor and inverter testing is the Power Analyzer's king's class and affords a high number of input channels for voltage and current measurement and completely synchronized data acquisition. The Dewesoft R&D power analyzer makes it possible to measure 8x three phase systems within just one device. That unique feature allows to measure whole power systems (e.g. electric vehicle, aircraft, ship) completely synchronous. It combines all functionalities of motor and inverter testing as described above and further allows to measure other parameters like speed, torque, temperature, video, GPS, CAN and a lot more as well. Up to now typical test bed applications needs the usage a couple of instruments (Power Analyzer, Scope, Data Logger, CAN reader etc.) ... The Dewesoft Power Analyzer makes it possible to do all these analysis within just one device. All data can be stored in the full-sampling rate and all analysis can be done already during measuring. The unique post-processing functionality allows also doing all analysis (mathematic, power analysis) after the measurement on the personal notebook. It's even possible to change settings or correct for example phase voltages if they were connected wrong. In this case the measurement doesn't have to be repeated. This is never experienced testing.

HIGHLIGHTS
- Efficiency, Power & Power Quality analysis
- Up to 8 three phase systems
- Different frequencies (DC, 16,7Hz/50Hz/ 60Hz/400Hz/variable frequency)
- Analyzing 1-7 phase motors
- Raw data analysis, Transient recording, Data logging, Scope, Vector Scope
- Additional measurements like speed, torque, temperature, etc.

TYPICAL ENGINE TEST BED APPLICATION

TYPICAL CONFIGURATION

Dewesoft R&D
12x Voltage
12x Current
1x Torque
1x Speed
Additional inputs (analogue, digital, counter, GPS, CAN, video, etc.)
Power Transformer Testing

Testing of power transformers makes a couple of different measurements necessary, which are described in the international standard IEC 60076. The Dewesoft Power Analyser with its special software tools for transformer analysis redefines the testing process. With the Scope and Vector Scope function the voltage ratio and phase displacement of different primary and secondary configurations (star, delta, interconnected star) can easily be analyzed. The transient recording functionality allows to store all signals at full sampling rate for detailed analysis. In combination with the trigger functionality failures and transient events (also during long-term measurements of the transformer) easily can be detected. The Power Quality Library allows measuring Harmonics of voltage and current up to some hundred kHz. The data can be represented in percentage of the fundamental frequency as required for the no-load current according to IEC 60076. Also the calculation of the zero-sequence impedance is required and automatically implemented in the Power Quality Library. The math library allows to automatically calculate parameters like the magnetising current, the iron losses, the main inductance for example out of the no-load test or the stray inductances out of the short-circuit tests. Power and Efficiency analysis of transformers requires highest accuracy of the power calculation for all phase angles. Especially the analysis at low power factors is difficult with conventional measurement equipment. The additional Sensor Calibration functionality in Dewesoft allows correcting the behavior of voltage and current transducers for amplitude and phase over the whole frequency range. Furthermore IEC 60076-1 requires the correction of the measured power losses depending on temperature. Dewesoft Power Analyser makes it easy to measure all required temperatures (winding, oil, ambient, etc.) perfectly synchronous to all other measured parameters. In addition it’s possible to calculate the corrected power losses automatically in the Math toolbox. You can also measure the power of oil pumps and fan motors, and even the sound level according to IEC 60076-1. This is full range testing of power transformers, that you have never experienced before.

Standby-Power

ACCORDING TO IEC62301

One important pillar for reducing the global energy consumption is increasing the energy efficiency. The reduction of the standby power consumption of electronic devices is a big step towards more energy efficiency and is defined in the international standard IEC 62301. There are several requirements for the measurement of the standby power. Measurement devices have to be able to measure very low currents (< 1mA) and very low power with specified accuracy (<0.5W with accuracy of 0.01 W >0.5 W with accuracy of 2%). Harmonic analysis up to the 49th order (2.5 kHz) is required and Data logging capability is strongly recommended. For the testing process it is also necessary to measure the voltage of the power supply, the THD, the temperature etc. which all have to be within specified limits. With Dewesoft all of these parameters can be measured and analysed automatically.

The biggest challenge for measuring standby power is measuring currents with high crest factor. The high crest factors are caused by the pulsed current of the power supply units. Furthermore input filters often produce reactive currents which can be a multiple of the active current. In older DAQ systems these issues forced you to set the measurement ranges much higher than required by the pure sinusoidal signal which decreased the accuracy. The dual core technology makes it possible to have a high range and best accuracy at the same time. It’s possible to measure every kind of current without compromises. The dual core technology uses two 24-bit AD converters in parallel: One AD converter measures the full input range and the other one measures 5% of the range. This makes it possible to have high accuracy for both the high and the low amplitude parts of your signal in one measurement. This unique technology is revolutionary for standby power measurement and reaches accuracies never seen before.

HIGHLIGHTS

- Analysis according to IEC 60076
- Correction of power losses depending on temperature
- Additional sensor calibration
- Harmonics, Symmetrical Components

HIGHLIGHTS

- Dual-Core measurement for low currents with high Crest factor
- Harmonics and THD
- Data Logging

TYPICAL CONFIGURATION

Dewesoft R2D8
- 8x Voltage
- 8x Current
- 3x Temperature
- Sound
- Additional sensor calibration

TYPICAL CONFIGURATION

Dewesoft Sirius Dual Core
- Voltage and Current
- Additional current transducer calibration for 50 or 60 Hz
Lighting Devices

The trend towards energy saving lighting makes fluorescent and LED lights more and more popular. In comparison to light bulbs there are ballast units which are working with switching frequencies up to 150 kHz. The high bandwidth (2 MHz) and Sample Rate (1 MS/s) of the Dewesoft Power Analyser guarantees reliable analysis for every kind of lighting. The power quality library automatically calculates parameters like Harmonics, THD, Flicker, etc. The math library allows determining efficiency, energy consumption and calculation of other parameters. For example the current through the fluorescent lamp can be determined via the math library out of the secondary current and the cathode current.

Equipment Testing

The flexible hardware design and the powerful software allows a couple of testing possibilities for all kind of electrical equipment. Monitoring In-Rush currents, voltage transients, harmonics and power quality analysis are just a few of the possible applications.

- Fans and pumps testing
- Circuit breaker and switch testing
- Filter analysis
- Capacitor testing
- Rod-Drop testing
- Harmonics analysis according to IEC 61000-3-2 /-12
- Voltage changes according to IEC 61000-3-3 /-11
- CE conformity of electrical devices (Harmonics, Flicker)
- And a lot more

Applications

E-Mobility

- ELECTRIC VEHICLE
- HYBRID VEHICLE
- HYDROGEN VEHICLE
- ELECTRIC MOTORCYCLE
- BATTERY TESTING
- CHARGING ANALYSIS
The Power Analysis module allows measuring every kind of motor (1-7 phase) and inverter (DC-AC, AC-AC, switching frequencies up to some 100 kHz). The modular hardware system allows measuring the power (AC or DC) at multiple points perfectly synchronized. This unique feature allows comprehensive analysis for all types of electric drivetrains (single motor, motor and generator, 2-4x in-wheel-motors) considering also other loads (heating, air-conditioning, 24V, 12V, etc.). The high sampling rate and bandwidth of the Dewesoft Power Analyser enable the measurement of wireless in-wheel motors. And thanks to the small physical size of the hardware, you can even use it to measure the efficiency of electric motorcycles and electric two-wheelers under real driving conditions.

Electric Vehicle Testing

Hybrid Testing

The Combustion Analysis (CA) module allows detailed analysis of the combustion process. The analysis is perfectly synchronised to the power analysis. The Dewesoft Combustion Analyser enables the user to display and compare measurement data using several different diagrams like, the p-V-diagram (pressure of angle) or the CA-Scope (pressure over angle). All CA specific calculations like the mean effective pressure (IMEP, PMEP), heat release, start/end of combustion (SOC, EOC), indicated power, maximum pressure (Pmax), derivate pressure (dp/da) are presented either as colour diagrams or as data tables. For more detailed analysis, statistical calculations per cylinder or over the complete engine can be performed. Additionally DEWESoft® provides a dedicated knocking detection and combustion noise algorithm. The basis for all of these calculations are precise angle position data and cylinder pressure measurement. Dewesoft provides the perfect hardware for this: the galvanically isolated SIRIUSi charge inputs (with up to 24Bit resolution) are in perfect sync to the DEWESoft® Super counters. This allows perfect analysis of Hybrid cars already during driving.

Hybrid Testing

COMBINED POWER AND COMBUSTION ANALYSIS

The drivetrain of hydrogen cars differs from pure electric vehicles due to the energy storage. While pure electric vehicle use a battery as energy storage, hydrogen powered vehicle use hydrogen as energy storage which is converted to electric power via a fuel cell. The drivetrain also includes a so called super capacitor which stores power for short-time peak loads (up to 2000A) and a battery pack. Testing of hydrogen cars affords a couple of AC and DC power measurements (see picture). To determine the efficiency of hydrogen cars, we need additional measurements, like voltage, current and hydrogen flow.

Hydrogen testing

Battery Testing

The battery as central element in the electrical powertrain strongly affects performance and range of electric vehicles. Extensive tests are necessary: starting from the cell characteristics up to the complete powertrain. Detailed analysis requires temperature and voltage measurement at multiple points (e.g. 50x cell voltage and 50x cell temperature). The flexible and scalable solution from Dewesoft allows to measure more than 1000 channels from different sensors, perfectly synchronised. The Dewesoft Power Analyser system can be used for the development of batteries (efficiency analysis, cell characterisation, endurance tests, crash tests, short-circuit analysis, overheating / overloading tests, ageing tests, etc.) as well as for monitoring applications (data logging, transient recording, charge-discharge analysis, etc.).

Battery Testing

Charging Analysis

Charging analysis can be done for conductive charging (AC or DC) and as well for the increasingly popular inductive charging. The inductive charging process (also called wireless power transfer) affords high switching frequencies of the inverter (up to 150 kHz) to reach maximal efficiency of the power transfer. The high bandwidth (2 MHz), the high Sampling Rate (1 MS/s) and the possibility to measure AC and DC currents of the Dewesoft Power Analyser fulfills all requirements for testing both, conductive and inductive charging.

Charging Analysis
Test Bed Application

The innovative solution of Dewesoft allows measuring the energy consumption of electric vehicles at the test bench as well as inside the vehicle under real-driving conditions with the same measurement device.

In-Vehicle Use

For the mobile application the measurement device can be powered by hot-swappable battery packs so that measurements up to several hours are possible. All sensors (current transducers, GPS, Video) and further equipment like displays can be powered from the measurement device itself.

Analysis Functionalities

Also the zero-flux transducer which need a lot of power (up to 20 watts per unit) can be powered via the additional MCTS power slice.

Test bench

For the application at the test bench there are several interfaces (CAN, OPC, DCOM, etc.) to get data from the testbench control or send data out. The DEWES-NET option provides remote-control features for the DEWESoft® measurement system, so that you can control the whole test procedure from a single PC in the control room.

Exemplary E-Mobility

MEASUREMENT RESULTS

ONLINE ANALYSIS OF EFFICIENCY – RECUPERATION – ENERGY BALANCE

Standardised driving cycles (NEFZ, WMTC, etc.) are not suitable to measure the energy consumption of electric vehicles. They don't consider all aspects which influence the energy consumption of vehicles and are always done on roller test benches. The future of electric vehicle testing is analysing them under real-life conditions. The innovative solution of Dewesoft allows doing all analysis already during measurement. The sophisticated math functions can calculate different parameters like efficiency, recuperation, etc. and the user-friendly and customizeable software interface allows visualisation of all these parameters.

The chart shows the exemplary energy flow of an electric vehicle.

Some inverters of electric vehicles (e.g. bus) are working at different switching frequencies to increase the efficiency in different driving situations (city / overland drive). With the Dewesoft Math library it is possible to filter out the currently used switching frequency and automatically do the analysis for different switching frequencies (using logical conditions).

There are a lot of parameters which can influence the energy consumption of electric vehicles. These parameters can be ambient parameters like temperature, weather, quality of the road or different driving situations (uphill, downhill, city-, overland- or combined drives) or also different drivers. The Dewesoft Power Analyser makes it possible to do energy analysis considering all of these parameters already during the test drives.

The first chart shows an example of the acceleration behavior of different test drivers on the same test track (left) and the analysis at different driving situations (right). The acceleration behavior can influence the energy consumption of up to 10 %.

The second chart shows the acceleration of the scooter at different driving situations. The green chart is the acceleration with full-charged battery, the blue one when the battery was nearly empty, the red one for uphill and the magenta one for downhill driving.

HIGHLIGHTS

- Efficiency, Power analysis
- Test Bed application and In-Vehicle Use
- Up to 8 three phase systems
- Electric Vehicle, Hybrid & Hydrogen testing
- Battery and Charging analysis

TYPICAL CONFIGURATION

Dewesoft R&D
1x Voltage
17x Current
1x Torque
1x Speed
Additional inputs (analogous, digital, counter, GPS, CAN, video, etc.)

ANALYZING DIFFERENT DRIVING SITUATIONS

There are a lot of parameters which can influence the energy consumption of electric vehicles. These parameters can be ambient parameters like temperature, weather, quality of the road or different driving situations (uphill, downhill, city-, overland- or combined drives) or also different drivers. The Dewesoft Power Analyser makes it possible to do energy analysis considering all of these parameters already during the test drives.

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CHARGING PROFILE, CHARGING TIME AND EFFICIENCY

The data logging capability of the Dewesoft Power Analyser allows recording the complete charging process.

Example Analyzing Charging Profile (red = charging power, orange = energy, violet = power factor):

- Charging Part 1: Continuous charging with high power. Within 4 hours 80% of the battery is charged.
- Charging Part 2: Reaching of the charging end voltage and short interruption. 86% charged.
- Charging Part 3: Last charging part with low power. Within 14 hours battery is fully charged.

CHARGING PROFILE, CHARGING TIME AND EFFICIENCY

EMC TESTS OF CHARGING DEVICES ACCORDING TO IEC61000-3-2 AND IEC 61851

DEWESoft® supports EMC conformity tests of charging devices according to IEC 61000-3-2. The Power Quality Library automatically calculates all necessary parameters.

<table>
<thead>
<tr>
<th>Harmonic order</th>
<th>Frequency [Hz]</th>
<th>Current [A]</th>
<th>Current Limit [A]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>1.82</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>150</td>
<td>1.43</td>
<td>1.14</td>
</tr>
<tr>
<td>5</td>
<td>250</td>
<td>0.95</td>
<td>1.14</td>
</tr>
<tr>
<td>7</td>
<td>350</td>
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<tr>
<td>9</td>
<td>450</td>
<td>0.45</td>
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<tr>
<td>11</td>
<td>550</td>
<td>0.44</td>
<td>0.33</td>
</tr>
<tr>
<td>13</td>
<td>650</td>
<td>0.36</td>
<td>0.21</td>
</tr>
<tr>
<td>15</td>
<td>750</td>
<td>0.22</td>
<td>0.15</td>
</tr>
</tbody>
</table>

Instruments like the Harmonic FFT, the Harmonic table, Harmonic reference curve and the scope function ensure fast and reliable analysis.

Additional Automotive Testing Possibilities

Using the Dewesoft measurement devices allows a couple of another automotive testing possibilities see the list of applications. More details can be found in the Automotive Testing brochure.

- Autonomous Driving
- Vehicle dynamics
- Ride and handling tests
- Brake testing
- Advanced driver assistance systems
- Pass by Noise

- Road Load Data
- Performance testing
- Component testing
- Modal analysis
- Structural testing

- Crash tests
- Structural testing

- Climate Testing
- Air Conditioning Testing
Applications

Power System Testing

- **POWER QUALITY ANALYSIS**
- **RENEWABLE TESTING**
- **SMART GRID**
- **RAILWAY TESTING**
- **AIRCRAFT TESTING**
- **MARINE TESTING**

**POWER GRID**
- Fault & Transient Recording
- Power Quality Analysis (DSE 1179, EN 50160)
- Transformer Efficiency Analysis (IEC 60076-1)
- No-load and short circuit testing
- Vibration, Noise (see Dynamic Signal Analysis brochure)
- Power Performance (IEC 60287-152)
- Power Quality (IEC 61000-3-2 / IEC-TR3)
- Behavior at Faults (IEC-TR3)

**WIND, SOLAR AND CHP**
- Power Performance (IEC 61400-21 / FGW-TR3)
- Power Quality (IEC 61400-21 / FGW-TR3)

**NUCLEAR POWER PLANT**
- Turbine & Generator Testing
- Rod Drop Testing
- Castor Testing

**TURBINE & GENERATOR**
- Modal Analysis (see Dynamic Signal Analysis brochure)
- Order Tracking (see Dynamic Signal Analysis brochure)
- Balancing (see Dynamic Signal Analysis brochure)
- Rotational Vibrations (see Dynamic Signal Analysis brochure)
- Efficiency Measurement

**SMART GRID & ENERGY MANAGEMENT**
- Power System Testing
- Load profile
- Demand Side Management

**AIRCRAFT**
- Power System Testing
- Fault & Transient Recording
- Hybrid Testing (Combustion & Power)
- Aerodynamic Analysis

**MARINE**
- Power System Testing (IEC & DC cables)
- Power Quality Analysis
- Short-Circuit Analysis
- Fault & Transient Recording
- Pantograph & Current Shoe Testing

**RAILWAY**
- Power System Testing (AC & DC rails)
- Power Quality Analysis
- Short-Circuit Analysis
- Fault & Transient Recording
- Pantograph & Current Shoe Testing
- Traction Power / Electric Two Wheeler
- Hybrid Vehicle (series and parallel)
- Hydrogen Vehicle

**E-MOBILITY**
- Evac and pumper testing
- Circuit Breaker testing
- Filter analysis
- Harmonic analysis according to IEC 61000-3-2/12
- Voltage changes according to IEC 61000-3-12
- CE conformity of electrical devices (Harmonics, Flicker) ... and a lot more

**EQUIPMENT TESTING**
- Fans and pumps testing
- Current test
- Filter analysis
Fault & Transient Recording

Uncommon system conditions or events like voltage interruptions, overvoltage, harmonics etc. can affect the function of different electrical devices which are connected to the grid. It’s not unusual that devices stop working or even get destroyed due to different extraordinary system events and conditions (see table). The impact of these faults can occasionally be very expensive (e.g. outage of production line) or even can lead to the outage of the whole power system.

The raw data storing function in combination with the different triggering functions of the Dewesoft Power Analyser allows measuring, monitoring and analyzing of every kind of faults. In addition to triggering on all input channels (analogue, digital, etc.) it’s also possible to set trigger on mathematical or power channels. For example, triggering on power quality parameters like unbalance, harmonics, THD etc. is possible. The analysis can be done at all line frequencies: Railway Grid (16.7 Hz), Public Grid (50Hz, 60Hz), Aircraft Systems (400Hz, 800Hz) and at variable frequencies (inverter).

TYPICAL CONFIGURATION

Dewesoft PWR
3x Voltage
3x Current

Dewesoft Sirius R8D
4x Voltage
16x Current

Smart Grid & ENERGY MANAGEMENT

In a conventional power system the power is produced at big generation units (thermal, nuclear, hydro) and transported via overhead lines to the customer. The increasing amount of renewable power plants transforms this centralised power system more and more to a decentralized power system. But this more and more decentralized power system causes problems because the power system equipment is not designed for it. Therefore intelligent usage and control of power is the future, called Smart Grid. In a Smart Grid energy consumers and producers should communicate and interact together to avoid problems in the power system to allow consumers and producers to measure the power at multiple points in the grid makes it very easy to identify big loads, inefficient equipment, the standby consumption, peak loads and a lot more.

The different Power Quality parameters describe the deviation of the voltage from its ideal sinusoidal waveform at a certain frequency. These deviations can lead to disturbances, outages or damages of electrical equipment connected to the grid. It is essential to permanently track these parameters starting during the development phase (of the electrical equipment), until live operation (e.g. continuous monitoring of a couple of points in the electrical grid in order to prevent and correct quality disturbances.

Power Quality Analysis

The Dewesoft Power Analyser is able to measure all of these parameters according to IEC 61000-4-30 Class A. In comparison to other Power Quality analysers it’s possible to do more detailed analysis (e.g. raw data storing, behavior at faults, calculation of additional parameters etc.).

HARMONIC ANALYSIS

Harmonics are integer multiples of the fundamental frequency (e.g. 50 Hz) and cause a distortion in voltage and current of the original waveform. Harmonic voltages and currents caused by non-sinusoidal loads can affect operation and lifetime of electrical equipment and devices. Harmonic frequencies in motors and generators can increase heating (iron & copper losses), can affect torque (pulsating or reduced torque) can create mechanical oscillations and higher audible noise, causes ageing of shaft, insulation and mechanical parts and reduce the efficiency. Current harmonics in transformers increase copper and stray flux losses. Voltage harmonics increase iron losses. The losses are directly proportional to the frequency and, therefore, higher frequency harmonic components are more important than lower frequency components. Harmonics can also cause vibrations and higher noise. The effects to other electrical equipment and devices are very similar and are mainly reduced efficiency and lifetime, increased heating, malfunction or even unpredictable behaviour.

Dewesoft allows measuring harmonics for voltage, current and additional active and reactive power up to the 3000th order. All calculations are implemented according to IEC 61000-4-7. The number of sidebands and halfbands for the harmonic order calculation is definable. The higher frequency parts can be grouped in 200 Hz bands up to 150 kHz. The calculation of THD (overall harmonic content) for voltage and current up to 3000th order and the Interharmonics complete the analysis functions of Dewesoft. These powerful harmonic calculation functions allow analysis for all types of electrical equipment and devices.
Flicker and Flicker Emission

Flicker is a term for the fluctuations (repeated variations) of voltage. Flashing light bulbs are indicators for a high flicker exposure. Flicker is especially present at grids with a low short-circuit resistance and is caused by the frequent connection and disconnection (e.g. heat pumps, rolling mills, etc.) of loads which affect the voltage. A high level of flicker is perceived as psychologically irritating and can be harmful to people. The Dewesoft Power Analyser allows to measure all flicker parameters according to IEC 61000-4-15. The flicker emission calculation is implemented according to IEC 61000-4-21 and allows the evaluation of flicker emission in the grid caused by wind power plants or other generation units.

Rapid Voltage Changes

The Rapid Voltage Changes are parameters which are added as a supplement to the flicker standard. Rapid Voltage Changes describe all voltage changes which are changing the voltage for more than 3% at a certain time interval. These voltage changes can afterwards be analysed with different parameters (depth of voltage change, duration, steady state deviation, etc.).

Unbalance - Symmetrical Components

Unbalance means that the voltages (U1, U2, U3) and currents (I1, I2, I3) of a three phase system are not equal. This happens due to phases which are loaded unevenly. To analyses the unbalance, the calculation method of the symmetrical components is used. This method splits the original system in a positive system (rotation like original system), the negative system (rotation in reverse direction) and a zero system. This allows to calculate a couple of parameters for voltage, current, active-, reactive- and apparent power unbalance. The Dewesoft Power Analyser allows to measure more than 50 different parameters for comprehensive analysis of the unbalanced system condition. An unbalanced system condition can lead to currents in the neutral line, warming and decrease of efficiency of different electrical equipment and even increase harmonic currents.

Frequency Deviations

High frequency deviations in public grids can have severe consequences to the electrical grid. If the frequency drops or rises too much it is even possible that the whole power system breaks down (Blackout). Frequency deviations are caused by the connection and disconnection of power plants or big loads. If the frequency is too high, there is too much power in the grid. If it is too low, there is too little power in the grid. Especially the trend towards more renewable power plants is causing more and more frequency deviations due to the abrupt disconnection and connection (PV, Wind) of generation units. The Dewesoft Power Analyser can be used for frequency monitoring and for testing the frequency behavior of power generation units at development (see Renewable Testing).

Active & Reactive Power

- Reactive power for L, M and N
- Input and output power (AC, DC)
- Calculations of harmonic, asymmetrical and symmetrical components
- Period values of voltage and current
- Calculation of deviation, min, max, averaged values

Power Quality

- Flicker
  - Flicker coefficient (c) at different phase angles (30, 60, 75, 90°) according to IEC 61000-4-15
- DC input power, maximum output power

Behavior at Faults

- Operation at different set points for active and reactive power
- Power quality according to IEC 61400-21
- Calculation of normalized active, reactive, apparent power
- Calculation of harmonic, interharmonic and THD
- Calculation of step factor (ks, kf) and deviation factor (k)
- Analysis of fault length and specification of short-time interruption (STI) and low voltage ride through (LVRT)
- Raw data analysis: waveform, etc. (harmonic, etc.)
- Analysis of fault length and specification of short-time interruption (STI) and low voltage ride through (LVRT)
- Raw data analysis: waveform, etc.
- Calculation of harmonic, interharmonic and THD
- Calculation of 30, 60, 75 and 90° deviation
- Full and half wave analysis
- Harmonics: remainder figure

Evaluation of reactive power provision

- S, Q, cos phi
- Voltage of positive sequence system
- Higher harmonics from 2 to 6 kHz in 200 Hz bands (possible up to 155 kHz)

Rapid Voltage Changes

- Power reduction at increasing frequency
- Power reduction at decreasing frequency
- Evaluation of reactive power provision
- Calculation of deviation, min, max and averaged values
- Calculation of harmonic, interharmonic and THD
- Calculation of step factor (ks, kf) and deviation factor (k)
- Analysis of fault length and specification of short-time interruption (STI) and low voltage ride through (LVRT)
- Raw data analysis: waveform, etc.
- Calculation of harmonic, interharmonic and THD
- Calculation of 30, 60, 75 and 90° deviation
- Full and half wave analysis
- Harmonics: remainder figure
- Higher harmonics from 2 to 6 kHz in 200 Hz bands (possible up to 155 kHz)

Renewable Testing

According to FGW-TR3, VDE-AR4105, BDEW etc.

Renewable Power Plants like Wind, Photovoltaic (PV) and Combined Heat and Power Plant (CHP) are more and more popular all over the globe and the amount of installed power is already huge. For the operation at the public grid these renewable power generation units have to fulfill a couple of requirements to contribute to a stable operation of the grid. The standards, which define the conditions for operating the plant at the grid, vary from country to country: e.g. FGW-TR3, VDE-AR4105, BDEW etc. These regulations define the control of the active and reactive power, the limits of Power Quality emissions and the behavior at grid disturbances. Testing according to these regulations needs a couple of different test procedures and also different test equipment (Scope, Power Analyzer, Analysis software and mathematic calculations). The Dewesoft Power Analyser allows wide range analysis of Renewable power plants according to these standards. Special factors like flicker step factor, voltage change factor, symmetrical components, period values for E, Q, S, U, I (for half-wave or fullwave) etc. are calculated in the software. The recorder allows creating all necessary graphs with the different parameters (e.g. P-Q chart). The data logging capability allows storing the raw data for analysing the switching processes or the behavior at faults (Wavelength analysis). The Math Library allows calculation of any statistical parameters (e.g. max. active power for 0.2s, 0.6s and 60s) and offers also the possibility to automatically check if the power generation unit meets the requirements. Using the Dewesoft Power Analyzer allows comprehensive analysis of renewable generation units and will for sure save a lot of time during the testing process.

Specifications

- DVM, 6x voltage, 6x current
- Raw data storing (switching operations, faults)
- Power Quality analysis (Harmonics, etc.)
- Flicker, emission, coefficient, step factor
- Symmetrical components, period values

Accessories

- Power analysis for AC and DC
- Power data storing (switching operations, faults)
- Power Quality analysis (Harmonics, etc.)
- Flicker, emission, coefficient, step factor
- Symmetrical components, period values

Software

- Dewesoft Sirus R2D
- 6x Voltage
- 6x Current
- 1x Low Voltage input for setpoint value
Train and railways are operated either with DC or AC power. They are operated at different voltage levels (230V up to 66kV) and different line frequencies (16.7Hz, 50Hz, 60Hz). The trains get the power whether via a pantograph which is connected to overhead lines or via a conductor rail (third rail). Testing the power supply system of trains requires a high-precision DAQ system that supports a wide range of input signals like voltage, current, displacement, acceleration, GPS parameters, CAN-bus data and video. Especially video data which are synchronized to the other signals are very important and useful for comprehensive analysis (Monitoring connection of pantograph to overhead line, interaction of rails and conductor rail etc.). In addition to the high voltages also high operating currents up to 8000A are present which require special current transducers (AC and DC).

### Short Circuit Analysis

Short-circuit analysis at railway power supply systems is a typical application for the Transient recording function of the Dewesoft power analyser. At the expansion of short-circuits in railway power supply systems it is often assumed that the short-circuit current is split in thirds. One third flows via the return conductor, one third via the rail track and one third in the earth. In reality the results differs a lot and strongly depends on the ambient conditions (soil, grounding, etc.). The Dewesoft Power Analyser allows measuring the expansion of the short-circuit with automatic evaluation. Parameters like peak current, AC and DC part of the short circuit, time of the short circuit and a lot more can be calculated. Furthermore high-speed cameras and thermal imaging cameras can be connected to the system for comprehensive analysis.

### Highlights
- High sampling rate
- Storing raw data
- Triggering on different channels (analoge, digital, math, power, power quality etc.)
- Analysis at all line frequencies (16.7Hz, 50Hz, 60Hz, 400Hz, 800Hz, variable frequency)

### Typical Configuration

Dewesoft R2D
1x Voltage
7x Current

### Power System Testing

The electrical power for aircraft systems is provided either by a third rail or an overhead line via a pantograph as described before. Inside the rail the power has to be transformed to allow the operation of the different equipment. Typically, a train at first transforms the high supply voltage (e.g. 15 kV) down to a lower voltage range (< 1000V). Then the power is further transformed to different voltage levels and inverted to different frequencies (e.g. 16.7 Hz, 50Hz, DC). Testing the power system of railways therefore needs a high channel count and the possibility to analyse at different voltage levels and frequencies.

### Highlights
- Voltages up to 66 kV
- Currents up to 8000 A
- DC and AC power (16.7Hz, 25Hz, 50Hz, 60Hz)
- Video, GPS, acceleration, CAN, displacement etc.

### Typical Configuration

Dewesoft R8D
1x 3-phase power (50 Hz)
3x 1-phase power
(16.7Hz and 50 Hz)
3x DC power
**Aircraft**

The electromagnetic compatibility between electrical devices and systems in aircrafts is of essential importance. Standards like the EUROCAE ED-14D and ABD0100.1.8 have been established to define limits for harmonics. The harmonics are defined in ranges up to 150 kHz. The Dewesoft Power Analyser can handle voltage and current signals up to 250kHz. The analysis can be done for all fundamental frequencies starting from 0.5Hz up to 3000Hz (fundamental frequency in aircraft applications starts from 360 Hz up to 800 Hz).

**HARMONICS MEASUREMENT**

Dewesoft Power Analyser can handle voltage and current signals up to 250kHz. The analysis can be done for all fundamental frequencies starting from 0.5Hz up to 3000Hz (fundamental frequency in aircraft applications starts from 360 Hz up to 800 Hz).

**POWER SYSTEM TESTING**

The electrical power for aircraft systems is provided by the generators of the engines. Every generator supplies a certain part of the aircrafts power system. There is no parallel operation of the generators. If one generator fails, another one must take over immediately. Should all generators fail, the auxiliary power unit generator (APU) can power the whole aircraft (or parts of it). Even if the APU fails, there is still an emergency battery, that can provide enough power for an emergency landing.

Comprehensive and simultaneous power system analysis of aircrafts affords a high number of voltage and current measurements. Conventional power analysis methods often require many separate measurement devices which means a high effort to aggregate the data and tedious post synchronisation. The Dewesoft R8D solves all these problems in only one device: you can connect all required input channels to the R8D, so that they are perfectly synchronised, and DEWESoft® already shows the analysis results during measurement.

**HIGHLIGHTS**

- Harmonics analysis up to 150kHz
- Power Quality analysis

**TYPICAL CONFIGURATION**

Dewesoft PWR

3x Voltage

3x Current

**HIGHLIGHTS**

- Multiple power analysis (AC and DC)
- Harmonics & Power Quality analysis
- Transient recording, Data logging, Scope

**TYPICAL CONFIGURATION**

Dewesoft R8D

5x 1-phase power

7x 1-phase power

5x DC-power

Additional current transducer calibration for 400 Hz
Marine Testing
SHIP PROPULSION SYSTEM TESTING

Electrical power system of ships includes a couple of electrical equipment (motor, generator, pumps, etc.) which are operated at different voltage levels and frequencies. Testing of the whole power system needs a high number of voltage and current measurements for the power analysis. Using conventional measurement equipment requires using a number of measurement equipment and needs a high effort to aggregate and synchronise the data. Due to the unique system architecture of the Dewesoft Power Analyser it is possible to fulfill a number of measurement applications with just one device. The Dewesoft Power analyser combines all functionalities of an Oscilloscope, a Data logger, a FFT spectrum analyser, a Transient Recorder and a common Power Analyser. In combination with the powerful hardware and the high number of input channels comprehensive analysis of the whole ship’s power system are possible. The high accuracy (0.05 %), high sampling rate (up to 1 MS/s) and high bandwidth (2 MHz) of the Sirius high-voltage and low-voltage input amplifiers guarantee detailed analysis for wideband applications (frequency inverter analysis, efficiency and energy analysis, frequency monitoring, and a lot more). The power analysis can be done for different wiring schematics (DC, 1-3 phase AC) and also for different fundamental frequencies (50 Hz, 60 Hz, 400 Hz, 800 Hz, variable frequency). It is possible to do multiple power analysis within just one device. The acquisition of any additional analogue and digital signals as well as the possibility for combined Combustion analysis (see E-Mobility) characterise the unique testing possibilities.

HIGHLIGHTS
- Multiple power analysis (AC and DC)
- Combustion analysis
- Motor & Inverter analysis
- Power Quality analysis
- Transient Recording, Data Logging, Scope

TYPICAL CONFIGURATION
Dewesoft RBD
- 7x 3-phase power
- 4x 1-phase power
- 1x DC-power

Additional Dynamic Signal Analysis Possibilities

Furthermore you can extend your Dewesoft instrument in the field of DSA, dynamic signal analysis. With the same hardware and software you are able to cover nearly all applications. More details can be found in the DSA brochure.

NOISE & VIBRATION
- Multi-domain analysis
- Filters
- Statistics
- FFT Analyser with multipurpose cursor functionalities

ROTATING MACHINERY
- Order tracking
- Orbit graph
- Torsional vibration
- Auto- & Cross-Correlation
- Bearing fault
- Balancing

STRUCTURAL ANALYSIS
- Modal testing
- Sweep-sine and hammer impact test
- ODS
- Shock testing
- Short-time FFT
- Human body vibration

ACOUSTIC ANALYSIS
- Sound Level
- Sound Power
- True Octave Analysis
- Audio replay
- Pass-by Noise

HIGHLIGHTS
- Combustion analysis
- Motor & Inverter analysis
- Power Quality analysis
- Transient Recording, Data Logging, Scope
## Specifications

### DEWESoft® DS-R8D PWR

<table>
<thead>
<tr>
<th>Overview</th>
<th>DS-R2DB PWR</th>
<th>SIRIUS PWR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Max. Isolated Channels</strong></td>
<td>64</td>
<td>16</td>
</tr>
<tr>
<td><strong>Sample Rates</strong></td>
<td>1Ms / 16 Bit</td>
<td>1Ms / 16 Bit</td>
</tr>
<tr>
<td><strong>Bandwidth</strong></td>
<td>200kHz</td>
<td>2MHz</td>
</tr>
<tr>
<td><strong>Fanless operation only for BNC or Banana version (without excitation)</strong></td>
<td>500 Ms, 2 Ms, 4 Ms, 8 Ms, 10 Ms, 20 Ms</td>
<td>100 µs, 500 µs, 1 ms, 5 ms, 10 ms, 20 ms</td>
</tr>
<tr>
<td><strong>Input Coupling</strong></td>
<td>DC, AC 1 Hz (3 Hz, 10 Hz per SW)</td>
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<tr>
<td><strong>Overvoltage protection</strong></td>
<td>100 V</td>
<td>250 V</td>
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<tr>
<td><strong>ADC Type</strong></td>
<td>16 bit SAR with 100 kHz / 16 bit</td>
<td>16 bit SAR with 100 kHz / 16 bit</td>
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<tr>
<td><strong>Typical Power Consumption (max.)</strong></td>
<td>10 W</td>
<td>16 W</td>
</tr>
<tr>
<td><strong>Bridge modes</strong></td>
<td>Full bridge</td>
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### DEWESoft® DS-R2DB PWR

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<td><strong>ADC Type</strong></td>
<td>16 bit SAR with 100 kHz / 16 bit</td>
<td>16 bit SAR with 100 kHz / 16 bit</td>
</tr>
<tr>
<td><strong>Typical Power Consumption (max.)</strong></td>
<td>10 W</td>
<td>16 W</td>
</tr>
<tr>
<td><strong>Bridge modes</strong></td>
<td>Full bridge</td>
<td>Full bridge</td>
</tr>
</tbody>
</table>

### DEWESoft® SIRIUS PWR

<table>
<thead>
<tr>
<th>Overview</th>
<th>DS-R8D PWR</th>
<th>DS-R2DB PWR</th>
<th>SIRIUS PWR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Max. Isolated Channels</strong></td>
<td>64</td>
<td>16</td>
<td>8</td>
</tr>
<tr>
<td><strong>Sample Rates</strong></td>
<td>1Ms / 16 Bit</td>
<td>1Ms / 16 Bit</td>
<td>1Ms / 16 Bit</td>
</tr>
<tr>
<td><strong>Bandwidth</strong></td>
<td>200kHz</td>
<td>2MHz</td>
<td>2MHz</td>
</tr>
<tr>
<td><strong>Fanless operation only for BNC or Banana version (without excitation)</strong></td>
<td>500 Ms, 2 Ms, 4 Ms, 8 Ms, 10 Ms, 20 Ms</td>
<td>100 µs, 500 µs, 1 ms, 5 ms, 10 ms, 20 ms</td>
<td></td>
</tr>
<tr>
<td><strong>Input Coupling</strong></td>
<td>DC, AC 1 Hz (3 Hz, 10 Hz per SW)</td>
<td>DC, AC 1 Hz (3 Hz, 10 Hz per SW)</td>
<td>DC, AC 1 Hz (3 Hz, 10 Hz per SW)</td>
</tr>
<tr>
<td><strong>Overvoltage protection</strong></td>
<td>100 V</td>
<td>250 V</td>
<td>1000 V</td>
</tr>
<tr>
<td><strong>ADC Type</strong></td>
<td>16 bit SAR with 100 kHz / 16 bit</td>
<td>16 bit SAR with 100 kHz / 16 bit</td>
<td>16 bit SAR with 100 kHz / 16 bit</td>
</tr>
<tr>
<td><strong>Typical Power Consumption (max.)</strong></td>
<td>10 W</td>
<td>16 W</td>
<td>25 W</td>
</tr>
<tr>
<td><strong>Bridge modes</strong></td>
<td>Full bridge</td>
<td>Full bridge</td>
<td>Full bridge</td>
</tr>
</tbody>
</table>
**SOFTWARE FUNCTIONALITY**

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Dewesoft Power Analyzer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Analysis</td>
<td>✓</td>
</tr>
<tr>
<td>Power Quality Analysis</td>
<td>✓</td>
</tr>
<tr>
<td>Post Processing</td>
<td>✓</td>
</tr>
<tr>
<td>Math Library</td>
<td>✓</td>
</tr>
<tr>
<td>Data logging - Raw data storing</td>
<td>✓ (Data storage on full sampling rate of 1MS/s per channel)</td>
</tr>
<tr>
<td>Scope</td>
<td>✓ up to 5 modes in one snapshot (down to -5 and flat)</td>
</tr>
<tr>
<td>Vector Scope</td>
<td>✓ (up to 5 sampling rates)</td>
</tr>
<tr>
<td>FFT</td>
<td>✓ (up to 1MS/s)</td>
</tr>
<tr>
<td>Harmonic FFT</td>
<td>✓ (up to 1MS/s)</td>
</tr>
<tr>
<td>Transient Recording</td>
<td>✓ up to 1MS/s</td>
</tr>
<tr>
<td>Triggering Channels</td>
<td>Analog, Digital, Current, gates, Power, etc.</td>
</tr>
<tr>
<td>Triggering options</td>
<td>Simple edge (rising, falling), Window (time-based limiting, learning), Pulses (width or shorter than duration), Window and Pulses width (step or falling slope with steepness)</td>
</tr>
</tbody>
</table>

**POWER ANALYSIS**

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Dewesoft Power Analyzer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Analysis for DC and AC</td>
<td>✓</td>
</tr>
<tr>
<td>Power Analysis</td>
<td>P, Q, S, cos phi, D (Distortions), DB (Harmonic distortion), IQ (active power of harmonics) (for each phase and total)</td>
</tr>
<tr>
<td>Fundamental Power</td>
<td>P, Q, S, cos phi, D, PH, PH1, PH, WHM (for each phase and total)</td>
</tr>
<tr>
<td>Voltage and Current</td>
<td>✓ (a/c DC)</td>
</tr>
<tr>
<td>Energy Calculation</td>
<td>✓ (Total, positive and negative (e.g. Rectification))</td>
</tr>
<tr>
<td>Efficiency</td>
<td>✓ (for each phase and total)</td>
</tr>
<tr>
<td>Mixing Schemes</td>
<td>DC, 1-phase, 2-phase, 3-phase delta, 3-phase star, 4-phase, and 6 phase (DC, RMS, PH), 7-phase (DC, RMS)</td>
</tr>
<tr>
<td>Star-Delta Calculation</td>
<td>✓ (for each phase)</td>
</tr>
<tr>
<td>Frequencies</td>
<td>✓ (Waveform and RMS values)</td>
</tr>
<tr>
<td>Frequency Source</td>
<td>✓ (Input voltage (V), current)</td>
</tr>
<tr>
<td>Period Values</td>
<td>✓ (Input voltage (V), current)</td>
</tr>
<tr>
<td>Number of cycles for Power Calculation</td>
<td>✓ (up to 100)</td>
</tr>
<tr>
<td>Power Averaging</td>
<td>✓ (from 1 to 99%)</td>
</tr>
</tbody>
</table>

**POWER QUALITY**

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Dewesoft Power Analyzer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harmonics (according to IEC61000-4-7)</td>
<td>up to 100 kHz for voltage, current, active, reactive power, phase angle and impedance</td>
</tr>
<tr>
<td>Variable Sidebands and Full Sidebands (according to IEC61000-4-7)</td>
<td>✓</td>
</tr>
<tr>
<td>Harmonics Smoothing Filter (according to IEC61000-4-7)</td>
<td>✓</td>
</tr>
<tr>
<td>Interharmonics (according to IEC61000-4-7)</td>
<td>✓</td>
</tr>
<tr>
<td>Total Harmonic Distortion (THD) (according to IEC61000-4-7)</td>
<td>✓ (Total)</td>
</tr>
<tr>
<td>Total Interharmonic Distortion (TIHD) and K Factor (according to IEC61000-4-7)</td>
<td>✓ (up to 150 kHz)</td>
</tr>
<tr>
<td>Higher Frequencies (according to IEC61000-4-7)</td>
<td>✓ (up to 150 kHz)</td>
</tr>
<tr>
<td>Fluctuations (according to IEC61000-4-15)</td>
<td>✓ (up to 1 kHz)</td>
</tr>
<tr>
<td>Flicker Detection (according to IEC61071-2)</td>
<td>✓ (up to 1 kHz)</td>
</tr>
<tr>
<td>Rapid Voltage Changes (according to IEC61000-4-15)</td>
<td>✓ (up to 1 kHz)</td>
</tr>
<tr>
<td>Symmetrical Components (according to IEC61000-4-16)</td>
<td>✓ (Positive, negative, zero)</td>
</tr>
<tr>
<td>Additional Symmetrical Components (according to IEC61000-4-16)</td>
<td>✓ (Positive, negative, zero)</td>
</tr>
</tbody>
</table>

**DIFFERENCES TO CONVENTIONAL POWER ANALYZERS**

<table>
<thead>
<tr>
<th>HARDWARE</th>
<th>CONVENTIONAL POWER ANALYZER</th>
<th>DWEESOF POWER ANALYZER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage and Current</td>
<td>4x voltage, 4x current</td>
<td>4x voltage or current</td>
</tr>
<tr>
<td>Accuracy</td>
<td>0.02 – 1%</td>
<td>0.01%</td>
</tr>
<tr>
<td>Sampling Rate</td>
<td>100 kS/s - 1 MS/s</td>
<td>1 MS/s</td>
</tr>
<tr>
<td>Bandwidth</td>
<td>200 kHz</td>
<td>1 MS/s</td>
</tr>
<tr>
<td>Resolution</td>
<td>16 bit</td>
<td>16 bit (24 bit on 20000S/s)</td>
</tr>
<tr>
<td>Additional Inputs</td>
<td>Temp, RPM</td>
<td>Analog, digital, counter, GPI, triggers, CAN, etc.</td>
</tr>
<tr>
<td>Storage Memory</td>
<td>28 – 50 ms</td>
<td>Full Sampling Rate</td>
</tr>
<tr>
<td>Storage Memory</td>
<td>30 MB – 1 GB</td>
<td>&gt; 1 TB</td>
</tr>
<tr>
<td>Storage Type</td>
<td>Flash</td>
<td>SSD or rotating hard disk</td>
</tr>
<tr>
<td>Synchronization</td>
<td>Yes</td>
<td>Yes, multiple devices</td>
</tr>
<tr>
<td>Different Sampling Rates</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Different Dewesoft Devices</td>
<td>No</td>
<td>Up to 100m</td>
</tr>
<tr>
<td>POWER SUPPLY</td>
<td>AC, no battery pack</td>
<td>AC or DC, rechargeable battery pack</td>
</tr>
<tr>
<td>Power Supply</td>
<td>AC, no battery pack</td>
<td>No</td>
</tr>
<tr>
<td>Power Supply for Instruments</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Display</td>
<td>5-10 inch VGA</td>
<td>17 inch Full-HD – Multi-Touch</td>
</tr>
<tr>
<td>Handling</td>
<td>Yes</td>
<td>Yes, Windows keyboard</td>
</tr>
<tr>
<td>Operating systems</td>
<td>dedicated OS</td>
<td>Windows or Linux</td>
</tr>
<tr>
<td>Analysis on device or PC</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Remote Communication</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**SOFTWARE DESCRIPTION**

<table>
<thead>
<tr>
<th>CONVENTIONAL POWER ANALYZER</th>
<th>DWEESOF POWER ANALYZER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Analysis</td>
<td>DC, 2-phase AC</td>
</tr>
<tr>
<td>Vector Scope</td>
<td>Yes</td>
</tr>
<tr>
<td>Additional Sensor Calibration</td>
<td>No</td>
</tr>
<tr>
<td>Period Values</td>
<td>No</td>
</tr>
<tr>
<td>Energy calculation</td>
<td>No</td>
</tr>
<tr>
<td>Math</td>
<td>Yes</td>
</tr>
<tr>
<td>Power Averaging</td>
<td>Yes</td>
</tr>
<tr>
<td>Process - Analysis after measurement</td>
<td>Yes</td>
</tr>
<tr>
<td>Flicker Emission</td>
<td>Yes</td>
</tr>
<tr>
<td>Interharmonics</td>
<td>Yes</td>
</tr>
<tr>
<td>Higher Harmonics</td>
<td>No</td>
</tr>
<tr>
<td>Symmetrical Components</td>
<td>Basic</td>
</tr>
<tr>
<td>Rapid Voltage Changes</td>
<td>No</td>
</tr>
<tr>
<td>Fluctuations</td>
<td>Yes</td>
</tr>
<tr>
<td>Flicker Emissions</td>
<td>No</td>
</tr>
<tr>
<td>Oscilloscope</td>
<td>No</td>
</tr>
<tr>
<td>FFT</td>
<td>No</td>
</tr>
<tr>
<td>Recorder / Data logging</td>
<td>Only averaged values</td>
</tr>
<tr>
<td>Triggering Recording</td>
<td>No</td>
</tr>
</tbody>
</table>
### Accessories

#### TRANSDUCER SPECIFICATIONS

<table>
<thead>
<tr>
<th>Model</th>
<th>IT 60-S</th>
<th>IT 200-S</th>
<th>IT 400-S</th>
<th>IT 700-S</th>
<th>IT 1000-S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Current Range DC, RMS</td>
<td>60 A</td>
<td>200 A</td>
<td>400 A</td>
<td>700 A</td>
<td>1000 A</td>
</tr>
<tr>
<td>Overload Ability</td>
<td>300 A</td>
<td>1000 A</td>
<td>2000 A</td>
<td>3500 A</td>
<td>4000 A</td>
</tr>
<tr>
<td>Max. burden resistor (100% of Ip)</td>
<td>10 ohm</td>
<td>10 ohm</td>
<td>2.5 ohm</td>
<td>2.5 ohm</td>
<td>2.5 ohm</td>
</tr>
<tr>
<td>Temperature Influence</td>
<td>&lt; 2.5 ppm/°C</td>
<td>&lt; 2 ppm/°C</td>
<td>&lt; 1 ppm/°C</td>
<td>&lt; 1 ppm/°C</td>
<td>&lt; 1 ppm/°C</td>
</tr>
<tr>
<td>Output Ratio</td>
<td>100 mA at 60 A</td>
<td>200 mA at 200 A</td>
<td>200 mA at 400 A</td>
<td>400 mA at 200 A</td>
<td>1 A at 1000 A</td>
</tr>
<tr>
<td>Bandwidth (0.5% of Ip)</td>
<td>DC ... 800 kHz</td>
<td>DC ... 500 kHz</td>
<td>DC ... 500 kHz</td>
<td>DC ... 250 kHz</td>
<td>DC ... 500 kHz</td>
</tr>
<tr>
<td>Linearity</td>
<td>&lt; 0.002%</td>
<td>&lt; 0.001%</td>
<td>&lt; 0.001%</td>
<td>&lt; 0.001%</td>
<td>&lt; 0.001%</td>
</tr>
<tr>
<td>Offset</td>
<td>&lt; 0.025%</td>
<td>&lt; 0.008%</td>
<td>&lt; 0.004%</td>
<td>&lt; 0.005%</td>
<td>&lt; 0.005%</td>
</tr>
<tr>
<td>Frequency Influence</td>
<td>0.04%/kHz</td>
<td>0.06%/kHz</td>
<td>0.06%/kHz</td>
<td>0.12%/kHz</td>
<td>0.06%/kHz</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-20 to 50°C</td>
<td>-40 to 85°C</td>
<td>-40 to 85°C</td>
<td>-40 to 85°C</td>
<td>-40 to 85°C</td>
</tr>
<tr>
<td>Humidity (@60°C)</td>
<td>95% RH non-condensing</td>
<td>95% RH non-condensing</td>
<td>95% RH non-condensing</td>
<td>95% RH non-condensing</td>
<td>95% RH non-condensing</td>
</tr>
<tr>
<td>Rated isolation voltage rms, single isolation</td>
<td>2000 V</td>
<td>2000 V</td>
<td>2000 V</td>
<td>1600 V</td>
<td>1000 V</td>
</tr>
<tr>
<td>CAT I, II, III standards</td>
<td>IEC 61010-1 standards</td>
<td>EN 50178 standards</td>
<td>EN 50178 standards</td>
<td>EN 50178 standards</td>
<td>EN 50178 standards</td>
</tr>
<tr>
<td>Test voltage</td>
<td>5.4 kV</td>
<td>5.4 kV</td>
<td>5.4 kV</td>
<td>4.6 kV</td>
<td>3.1 kV</td>
</tr>
<tr>
<td>Inner diameter</td>
<td>16 mm</td>
<td>16 mm</td>
<td>16 mm</td>
<td>10 mm</td>
<td>10 mm</td>
</tr>
<tr>
<td>DEWESoft® Shunt</td>
<td>5 ohm</td>
<td>5 ohm</td>
<td>2 ohm</td>
<td>2 ohm</td>
<td>1 ohm</td>
</tr>
</tbody>
</table>

#### POWER SUPPLY UNIT (FULL-INTEGRATED OR AS ADDITIONAL SLICE)

- **SIRIUSI-PWR-MCTS2 / SIRIUSIR-PWR-MCTS2**
  - Power supply: 9-36V DC
  - Max power consumption: 85W
  - Physical dimensions: 203 x 149 x 85 [mm]
  - Operating temperature: -20 to 50°C
  - Storage temperature: -40 to 85°C
  - Humidity: 55% RH non-condensing
  - Output: Isolated Power supply (110V DC, 30mA)
  - Output voltage: ±110V DC
  - Maximum output per channel: 28W
  - Short-circuit protection: automatic recovery
  - Over load protection: 150% of rated max. typ

#### CURRENT CLAMPS AC/DC

- **DS-CLAMP-150DC**
  - Type: Hall sensor
  - Range: 150 A rms / 300 A peak
  - Bandwidth: DC to 500 kHz
  - Accuracy: ± 1% or ± 2 mA
  - TEDS: Fully supported
  - Sensitivity: 20 mV/A
  - Resolution: 0.9 mV
  - Overload Capability: 3000 A (2 min)
  - Dimensions: 205 mm x 60 mm x 15 mm (Clamp opening d = 32 mm)

- **DS-CLAMP-1800DC**
  - Type: Hall sensor
  - Range: 1800 A peak
  - Bandwidth: DC to 500 kHz
  - Accuracy: ± 2.5% or ± 0.5A
  - TEDS: Fully supported
  - Sensitivity: 1 mV/A
  - Resolution: 0.9 mV
  - Overload Capability: 2000 A (2 min)
  - Dimensions: 205 mm x 60 mm x 15 mm (Clamp opening d = 32 mm)

#### ROGOWSKY COILS AC

- **DS-FLEX-300-17**
  - Type: Rogowski coil
  - Range: 300 Arms
  - Bandwidth: 5 Hz to 20 kHz
  - Accuracy: 1%
  - TEDS: Fully supported

- **DS-FLEX-3000-35**
  - Type: Rogowski coil
  - Range: 3000 Arms
  - Bandwidth: 5 Hz to 20 kHz
  - Accuracy: 1%
  - TEDS: Fully supported
# CURRENT CLAMPS AC

## DS-CLAMP-5AC

<table>
<thead>
<tr>
<th>Type</th>
<th>Iron-Core</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>5 A</td>
</tr>
<tr>
<td>Bandwidth</td>
<td>10 kHz</td>
</tr>
<tr>
<td>Accuracy</td>
<td>0,5%</td>
</tr>
<tr>
<td>Phase</td>
<td>≤ 2,5°</td>
</tr>
<tr>
<td>TEDS</td>
<td>Fully Supported</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>60 mV/A</td>
</tr>
<tr>
<td>Resolution</td>
<td>0,01 A</td>
</tr>
<tr>
<td>Overload Capability</td>
<td>Crest Factor of 5</td>
</tr>
<tr>
<td>Dimensions</td>
<td>135 x 51 x 30 mm (Clamp Opening d = 22mm)</td>
</tr>
</tbody>
</table>

## DS-CLAMP-15AC

<table>
<thead>
<tr>
<th>Type</th>
<th>Iron-Core</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>15 A</td>
</tr>
<tr>
<td>Bandwidth</td>
<td>10 kHz</td>
</tr>
<tr>
<td>Accuracy</td>
<td>1% for currents of 1 - 15 A / 2,5% for currents &lt; 1 A</td>
</tr>
<tr>
<td>Phase</td>
<td>≤ 3° for currents of 1 - 15 A / ≤ 5° for currents &lt; 1 A</td>
</tr>
<tr>
<td>TEDS</td>
<td>Fully Supported</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>100 mV/A</td>
</tr>
<tr>
<td>Resolution</td>
<td>0,01 A</td>
</tr>
<tr>
<td>Overload Capability</td>
<td>Crest Factor of 5</td>
</tr>
<tr>
<td>Dimensions</td>
<td>135 x 51 x 30 mm (Clamp Opening d = 22mm)</td>
</tr>
</tbody>
</table>

## DS-CLAMP-200AC

<table>
<thead>
<tr>
<th>Type</th>
<th>Iron-Core</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>200 A</td>
</tr>
<tr>
<td>Bandwidth</td>
<td>10 kHz</td>
</tr>
<tr>
<td>Accuracy</td>
<td>1% for currents of 100 - 240 A / 2,5% for currents of 18 - 100 A / 0,5% for currents of 0,5 - 10 A</td>
</tr>
<tr>
<td>Phase</td>
<td>≤ 2,5° for currents of 100 - 240 A / ≤ 5° for currents of 10 - 100 A / not specified for currents of 0,5 - 10 A</td>
</tr>
<tr>
<td>TEDS</td>
<td>Fully Supported</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>15 mV/A</td>
</tr>
<tr>
<td>Resolution</td>
<td>0,5 A</td>
</tr>
<tr>
<td>Overload Capability</td>
<td>Crest Factor of 5</td>
</tr>
<tr>
<td>Dimensions</td>
<td>135 x 51 x 30 mm (Clamp Opening d = 22mm)</td>
</tr>
</tbody>
</table>

## DS-CLAMP-1000AC

<table>
<thead>
<tr>
<th>Type</th>
<th>Iron-Core</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>1000 A</td>
</tr>
<tr>
<td>Bandwidth</td>
<td>10 kHz</td>
</tr>
<tr>
<td>Accuracy</td>
<td>0,3% for currents of 100A - 1200 A / 0,5% for currents of 10A - 100 A / 2% for currents &lt; 1A</td>
</tr>
<tr>
<td>Phase</td>
<td>≤ 0,7° for currents of 100A - 1200 A / ≤ 1° for currents of 10A - 100 A / not specified for currents ≤ 1A</td>
</tr>
<tr>
<td>TEDS</td>
<td>Fully Supported</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>5 mV/A</td>
</tr>
<tr>
<td>Resolution</td>
<td>0,001 A</td>
</tr>
<tr>
<td>Overload Capability</td>
<td>1200 A for 40 minutes</td>
</tr>
<tr>
<td>Dimensions</td>
<td>216 x 111 x 45 mm (Clamp Opening d = 53mm)</td>
</tr>
</tbody>
</table>

# SHUNTS

## MSI-20MA

<table>
<thead>
<tr>
<th>Type</th>
<th>Shunt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>20 mA</td>
</tr>
<tr>
<td>Accuracy</td>
<td>0,81%</td>
</tr>
<tr>
<td>Resistance</td>
<td>50 Ohm</td>
</tr>
<tr>
<td>TEDS</td>
<td>Fully Supported</td>
</tr>
</tbody>
</table>

## MSI-S5A-9M

<table>
<thead>
<tr>
<th>Type</th>
<th>Shunt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>5 A</td>
</tr>
<tr>
<td>Accuracy</td>
<td>0,81%</td>
</tr>
<tr>
<td>Resistance</td>
<td>8,1 Ohm</td>
</tr>
<tr>
<td>TEDS</td>
<td>Fully Supported</td>
</tr>
</tbody>
</table>

# Other Current Transducers for AC and DC measurement from 300 mA up to 4000 A on request.

# ACCESSORIES

## ALIGATOR CLIP

<table>
<thead>
<tr>
<th>Current</th>
<th>max. 32 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>CAT III / 1000 V</td>
</tr>
<tr>
<td>Colours</td>
<td>black, red, blue, yellow-green</td>
</tr>
<tr>
<td>Plugs</td>
<td>Ø 4 mm</td>
</tr>
<tr>
<td>Dimensions</td>
<td>92 x 38 mm</td>
</tr>
</tbody>
</table>

## SAFETY TEST LEAD

<table>
<thead>
<tr>
<th>Current</th>
<th>max. 32 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>CAT II / 1000 V, CAT III / 600 V</td>
</tr>
<tr>
<td>Cross Section</td>
<td>2,5 mm²</td>
</tr>
<tr>
<td>Colours</td>
<td>black, red, blue, yellow-green</td>
</tr>
<tr>
<td>Plugs</td>
<td>Ø 4 mm</td>
</tr>
<tr>
<td>Length</td>
<td>2,25 m / 3 m / 5 m</td>
</tr>
</tbody>
</table>

## SAFETY TEST LEAD FUSED

<table>
<thead>
<tr>
<th>Current</th>
<th>max. 8 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>CAT III / 1000 V</td>
</tr>
<tr>
<td>Cross Section</td>
<td>1 mm²</td>
</tr>
<tr>
<td>Colours</td>
<td>black, red</td>
</tr>
<tr>
<td>Plugs</td>
<td>Ø 4 mm</td>
</tr>
<tr>
<td>Length</td>
<td>2 m</td>
</tr>
</tbody>
</table>
ACCESSORIES

BATTERY PACKS FOR MOBILE SOLUTIONS

BP2i
- For SIRIUS and up to 4 SIRIUS slices
- Supports 2 Li-ion batteries each 96 Wh
- (total capacity: 192 Wh)
- Hot-swap functionality
- Status display
- Maximum output power: 160W
- Input voltage range: 10-36VDC
- Output voltage: 21V (powered), 11-16V (battery)
- Wrong polarity protection

BP4i
- For SIRIUS and up to 8 SIRIUS slices
- Supports 4 Li-ion batteries each 96 Wh
- (total capacity: 384 Wh)
- Hot-swap functionality
- Status display
- Maximum output power: 250W
- Input voltage range: 12-36 VDC
- Output voltage: 24V (powered), 11-16V (battery)
- Wrong polarity protection

DS-DISP-12
- 12” industrial grade display
- 1280x800 HD resolution
- Rugged housing
- Multi-touch
- 700 cd/m² high brightness
- -40 ... 80 deg. C operating range

CAN INSTRUMENTS
- 2, 4 or 8 high speed CAN interfaces (isolated)
- Synchronize with all DEWESoft instruments
- 5V / 500 mA sensor supply on each connector

OPTION ANALOG OUT
- 8 BNC connectors on rear side
- for analog output (on request also available on front side)
- Standalone Digital
- Signal Amplifier
- Control Channel
- Replay
- Function Generator

SYNCHRONISATION
- All Sirius systems can be combined to a multichannel system. Each can be used independently or as a single fully synchronized system
- 8 BNC connectors on rear side
- 1000V isolation
- Accuracy ±0.02 %
- Up to 600 fps @ VGA
- Real-time onboard JPEG compression
- Power over Ethernet
- IP67 available
- Water-, break- and dustproof (IP 67)
- Pullout handle
- Robust polyurethane rollers
- Foamed plastic adapted for corresponding measurement device

TEMPERATURE MEASUREMENT KRYPTON
- Thermocouple types: K, J, T, R, S, N, E, C, G, B up to 100 °C per channel
- Low Voltage ± 100 V up to 10 kHz per channel (BNC plug)
- 1000V isolation
- Accuracy ±0.02 %

TRANSPORT CASE
- Water-, break- and dustproof (IP 67)
- Pullout handle
- Robust polyurethane rollers
- Foamed plastic adapted for corresponding measurement device

NOTE