Power Analyzer

2018

POWER ANALYSIS

E-MOBILITY

POWER QUALITY ANALYSIS

POWER SYSTEM TESTING

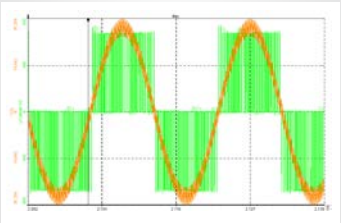
DEWESoft®
measurement innovation

DEWESoft® Power Analyzer

... INNOVATIVE POWER ANALYSIS NEVER EXPERIENCED BEFORE

HARDWARE

HIGH SAMPLING RATE
1 MS/s

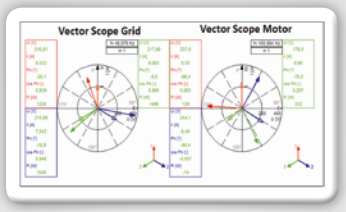


HIGH ACCURACY
0,03 %

Additional software calibration for current transducers

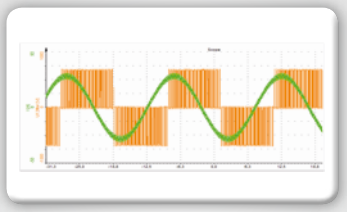
VOLTAGE INPUTS
Up to 1600V DC
CAT II 1000V /CAT III 600 V

POWER ANALYZER



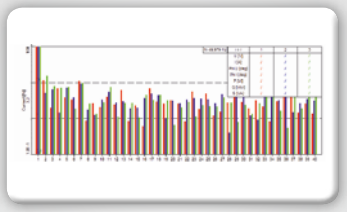
- *P, Q, S, PF, cos phi, ….*
  more than 100 calculated values

OSCILLOSCOPE



- *Scope and Vector Scope*

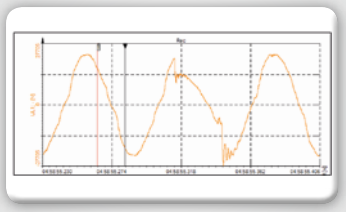
FFT & POWER QUALITY



- *FFT, Harmonic FFT, Harmonics, Interharmonics, Higher Frequencies, Flicker, Flicker emission etc.*

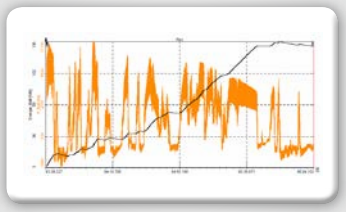
SOFTWARE

TRANSIENT RECORDING



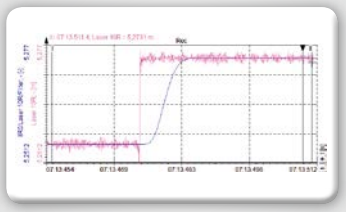
- *Triggering on analogue, math or power channels*

RECORDER / 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

SIRIUS*i*

SBOX (OPTIONAL)

R2DB

R3

R8D

8 Channel Power Analyzer
Optional with SBOX computer

- *8x Analogue inputs*
- *1x Three phase systems*
- *1 MS/s Sampling Rate*
- *0.03 % Accuracy*
- *Voltage up to 1600 VDC*
- *Optional SBOX computer*

16 Channel Power Analyzer
Mobile all-in-one instrument

- *16x Analogue inputs*
- *2x Three phase systems*
- *1 MS/s Sampling Rate*
- *0.03 % Accuracy*
- *Voltage up to 1600 VDC*
- *Time Sync: NTP, IRIG, GPS*

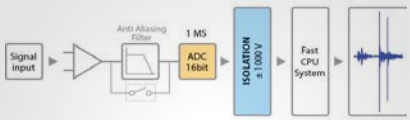
24 Channel Power Analyzer
for 19-inch reck

- *24x Analogue inputs*
- *3x Three phase systems*
- *1 MS/s Sampling Rate*
- *0.03 % Accuracy*
- *Voltage up to 1600 VDC*
- *Time Sync: NTP, IRIG, GPS*

64 Channel Power Analyzer
Compact all-in-one instrument

- *64x Analogue inputs*
- *8x Three phase systems*
- *1 MS/s Sampling Rate*
- *0.03 % Accuracy*
- *Voltage up to 1600 VDC*
- *Time Sync: NTP, IRIG, GPS*

FULLY ISOLATED



The worry free solution provides isolation on the sensor side (channel to GND, as well as, channel-to-channel) and even isolated sensor excitation! Less noise, no ground loups, best signal quality

CUSTOMIZABLE FRONT END

Select your amplifier configuration!
Example: DEWESoft® R3

- *8 x High-Voltage Input 1600V*
- *16 x Low-Voltage Input 50V with Screw Connector*

ONLINE TRAINING

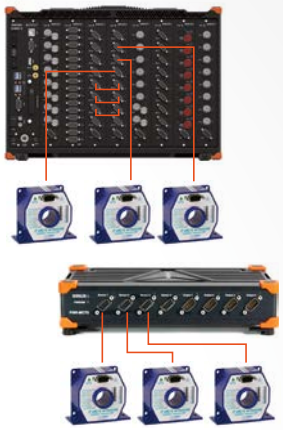
Go to pro.dewesoft.com and enjoy a lot of interactive training programms like: Current and Voltage Measurement, Power and Power Quality Analysis .....and a lot more

BATTERY PACK

BP2*i*

BP4*i*

SENSOR SUPPLY



CURRENT TRANSDUCERS

Hot Swapable 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*

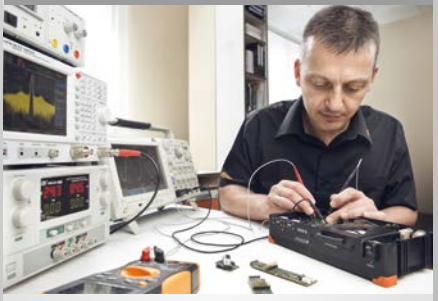
Current Measurement

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

INHOUSE 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.

DEWESoft® Power Analyzer

... SOLUTION FOR EVERY APPLICATION

POWER ANALYSIS

MOTOR S. 21

INVERTER S. 22

TRANSFORMER S. 24

E-MOBILITY

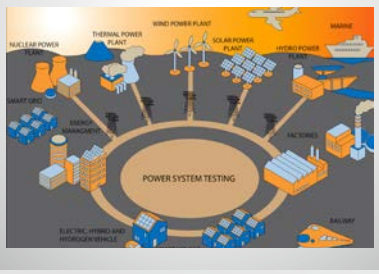
ELECTRIC VEHICLE S. 28

ELECTRIC MOTORCYCLE S. 28

HYBRID VEHICLE S. 28

POWER QUALITY ANALYSIS & POWER SYSTEM TESTING

SMART GRID & ENERGY MANAGEMENT S. 36

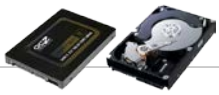


POWER QUALITY ANALYSIS S. 37

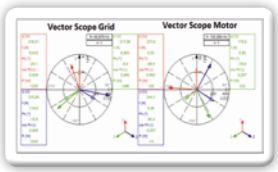
RENEWABLE TESTING S. 39

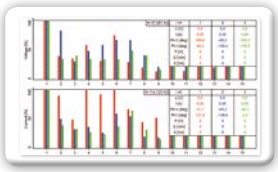
DIFFERENCES TO CONVENTIONAL POWER ANALYZERS

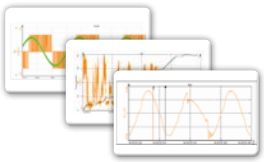
HARDWARE	DESCRIPTION	CONVENTIONAL POWER ANALYZER	DEWESoft® POWER ANALYZER
INPUTS	Voltage and Current	4x Voltage , 4x Current	64x current or voltage or mixed singal
	Accuracy	0,02 – 0,1 %	0,03%
	Sampling Rate	100 kS/s - 1 MS/s	1 MS/s
	Resolution	16 bit	16 bit (24bit @ 200kS/s)
	Sensor connection	Limited	Automatic sensor detection
	Additional inputs	Torque, RPM	Analoge, digital, counter, GPS, Video, CAN, etc.
STORAGE	Storage Intervall	20 – 50 ms	Full Sampling Rate
	Storage Memory	30 MB – 1 GB	> 1 TB
	Storage Type	Flash	SSD or rotating hard disk
SYNCHRONISATION	Synchronisation	No	Yes, multiple devices
	Different Sampling Rates	-	Yes
	Different DS Devices	-	up to 100 m
POWER SUPPLY	Power Supply	AC, no battery pack	AC or DC Hotswapable battery pack
	Power Supply for transducers	No	Yes
DISPLAY AND HANDLING	Display	5-10 inch VGA	17 inch Full-HD – Multi-Touch
	Handling	Push button, knob	Mouse, keyboard
	Operating system	dedicated OS	Windows
	Analysis on device or PC	No	Yes
	Remote Connection	No	Yes



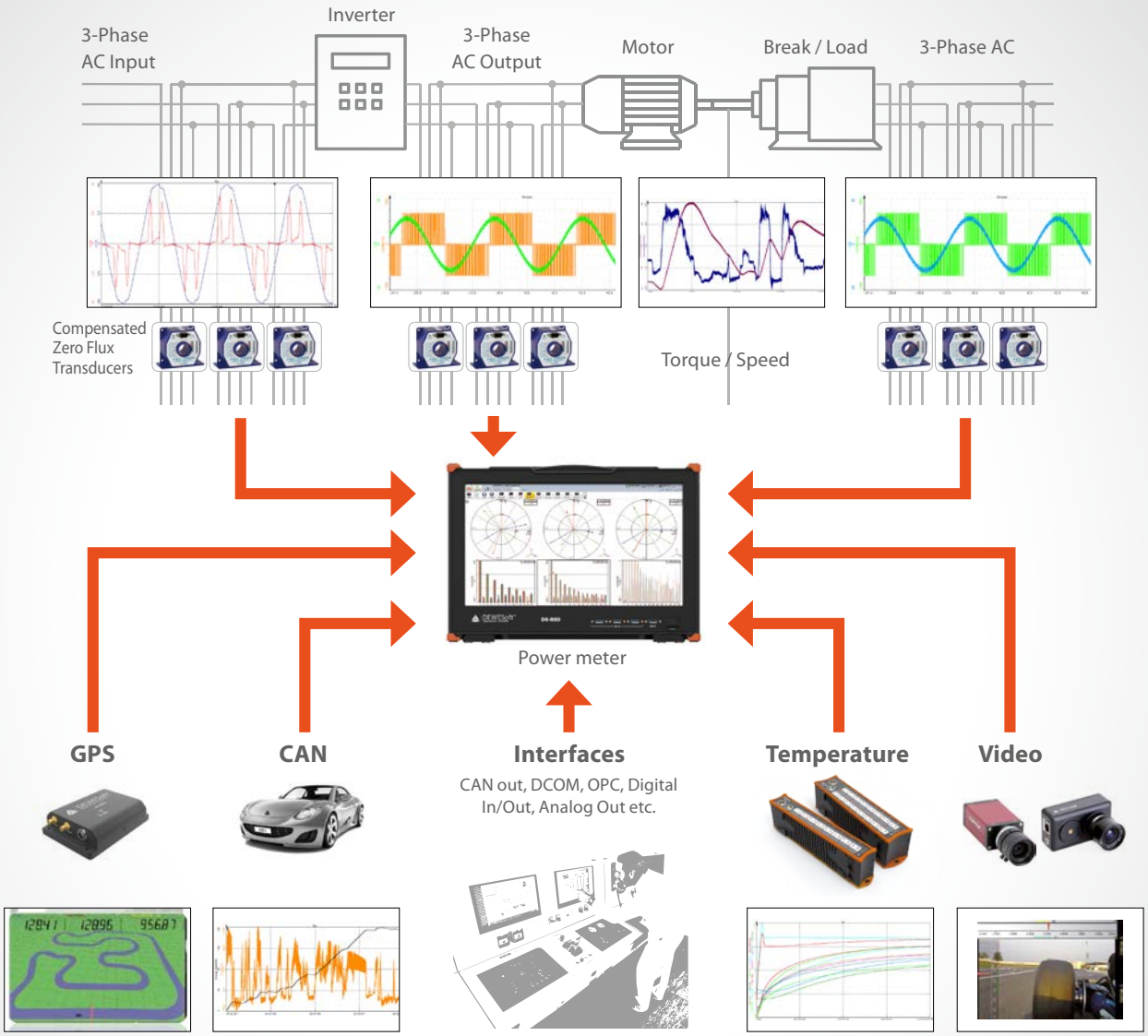
SOFTWARE	DESCRIPTION	CONVENTIONAL POWER ANALYZER	DEWESoft® POWER ANALYZER
POWER ANALYSIS	Power Analysis	DC, 1-3 phase AC	DC, 1-12 phase AC
	Vector Scope	Yes	Yes
	Additonal Sensor Calibration	No	Yes
	Period Values	No	Yes
	Energy calculation	No	Yes
	Math	~ 20 functions	> 100 functions
	Post Processing - Analysis after measurement	No	Yes
POWER QUALITY ANALYSIS	Harmonics, THD	Up to 500th order	Up to 3000th order
	Interharmonics	Yes	Yes
	Higher Frequencies	No	Up to 150 kHz
	Symmetrical Components	Basic	Extended
	Rapid Voltage Changes	No	Yes
	Flicker	Some	Yes
	Flicker emission	No	Yes
FUNCTIONALITIES	Oscilloscope	No	Yes
	FFT	No	Yes
	Recorder / Data logging	Only averaged values	Yes (Full sampling rate)
	Transient Recording	No	Yes (with different triggering options)
	Database Storing	No	Yes







DEWESoft® Power Analysis



Drawbacks of other instruments:

- *Usage of multiple data acquisition systems (Multimeter, Power Analyzer, CAN Logger, Data Logger, Videorecorder, etc.)*
- *Time synchronization between the DAQ systems*
- *Data merging (Data storage in different systems and formats)*
- *No continuous raw data acquisition*
- *Slow Calculation cycles of power Analyzer*
- *No Connection of additional sensors*
- *No mobile measurement system*
- *Only basic Power Quality Analysis*

… no comprehensive analysis possible

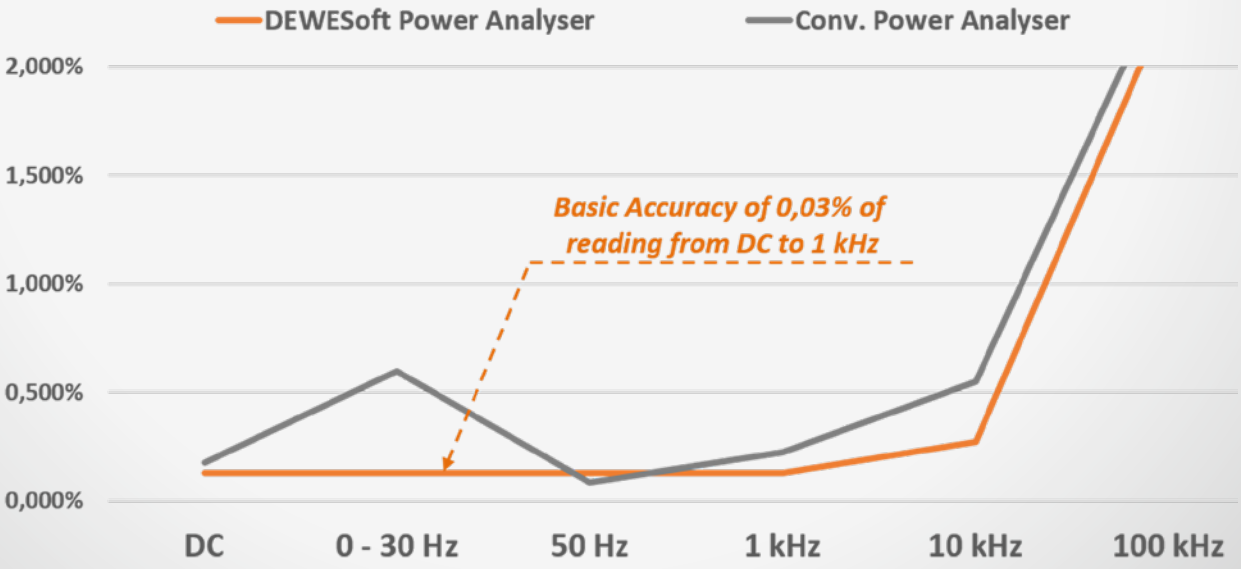
Benefits of the DEWESoft® Power Analyzer:

- *Combination of multiple products (Power Analyzer, Oscilloscope, Data Logger, Spectrum Analyzer, CAN logger, etc.)*
- *Synchronous acquisition of all data*
- *Data storage in one system and one format*
- *Combined Power Analysis and Raw Data storing*
- *Live Power calculation (1ms values)*
- *Enhanced Power Quality Analysis*
- *Any number and type of input channels*
- *Mobile measurement system*
- *Additional Sensor Software Calibration*

… Comprehensive Analysis within one measurement device

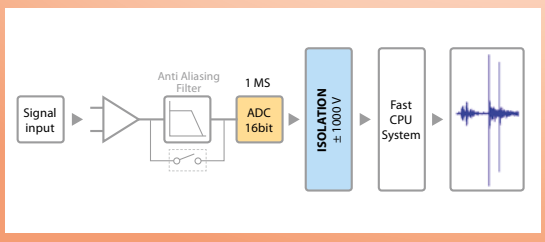
Precision Power Analysis

DEWESoft® measurement instruments are unique due to the powerful software which combines the functionality of a couple of instruments and also due to compact, flexible and rugged hardware. But DEWESoft® measurement instruments are also special because the high accurate input amplifiers. The basic accuracy from DC to 1 kHz is 0,03% (of reading).
Especially for Power Analysis high-accurate amplifiers are absolutely necessary. The new high-speed amplifiers for high- and low voltage inputs reach new dimensions in accuracy. This amplifiers now have a basic accuracy from DC to 1 kHz of 0,03% of reading (see orang line in chart). This is unique in Power Analyzer Market and especially at measurements with variable frequency drives absolutely necessary to reach highest-accurate measurement results. Other manufacturers often only have high accuracy at 50Hz/60Hz and the accuracy below and above is a lot worse (see chart grey line).



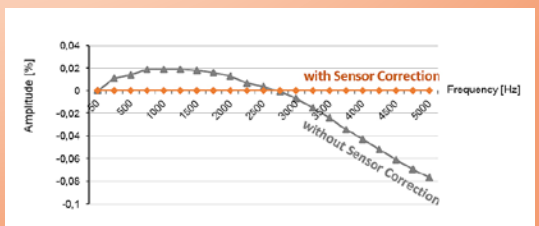
HIGH-ACCURATE AMPLIFIERS

High sampling rate (1 MS/s) of the DEWESoft® voltage and current amplifiers and high accuracy (0,03 % Base Accuracy). Flexible filtering options (100 kHz, 5th order, Bessel or free programmable digitale IIR Filter in FPGA). For bandwidth requirement of up to 500 kHz the complete filter chain is bypassed.



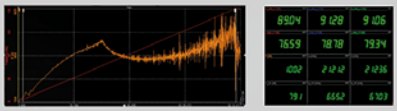
SENSOR CORRECTION (SOFTWARE)

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 (e.g. iron-core clamp, AC/DC clamp , rogowsky coils, grid current/voltage transducer)

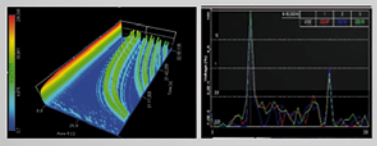


DEWESoft® Power Quality Analysis

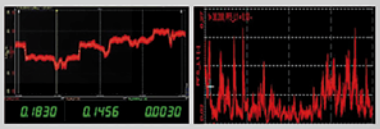
Harmonics up to 150kHz,
Interharmonics, Higher Frequencies,



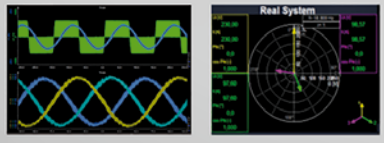
Power, Efficiency, Energy,
Period Values, Power of Harmonics



FFT Analyser, Waterfall-FFT



Flicker, Flicker Emission, RVCs



Scope, Vector Scope for each Harmonic

Extended Symmetrical Components

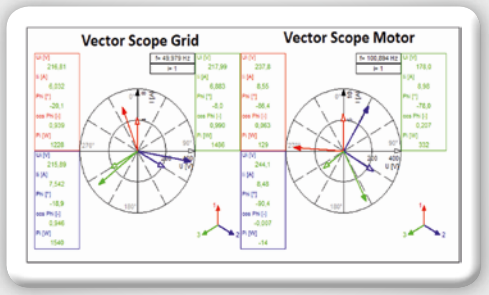
COMPARISON TO CONVENTIONAL POWER ANALYZERS

	Conventional PQ Analyzer	DEWESoft® PQ Analyzer
Harmonics	Up to 2,5 kHz	**Up to 150 kHz, variable sidebands & halfbands**
Interharmonics	Not possible	**Up to 150 kHz**
Higher Frequencies	Not possible	**Up to 150 kHz**
Flicker	PST, PLT	**Short Time Flicker (PST), Long Time Flicker (PLT), Instantaneous Flicker (Pinst)** – all with selectable time intervall
Flicker emission	Not possible	**I_PST, I_PLT, Flicker coefficient, Flicker step factor**
Unsymmetry	Only Unbalance factor	**U, I, P, Q, S for zero-, positive-, and negative sequence system**
Voltage Changes	No RVCs, Voltage via 10min AVE, Transient Recording	**Rapid Voltage Changes, Transient Recording, Raw Data**
Frequency behaviour	Via 1 min AVE	**Definable Averaging**

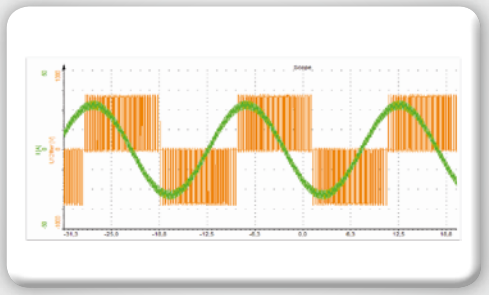
Software

The unique system architecture of the DEWESoft® Power Analyzer makes it possible to fulfill a couple of tasks within just one device. The DEWESoft® Power Analyzer combines the functionality of a Power Analyzer, a Combustion Analyzer, a Data logger, a Scope, a Vector Scope, a Transient Recorder and a FFT – Harmonics Analyzer. Acquiring different signals (analog, digital, counter, CAN, video etc.) simultaneously from different sources with different sampling rates and storing them in one file allows comprehensive, not yet experienced analysis for all type of applications.

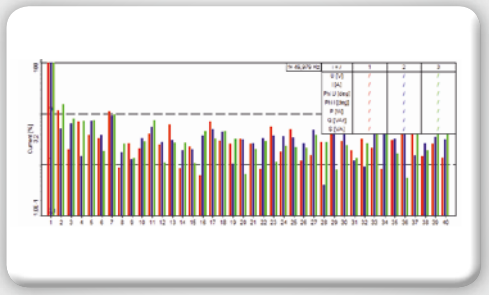
POWER ANALYSIS



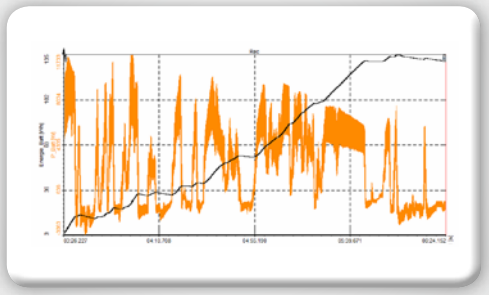
OSCILLOSCOPE



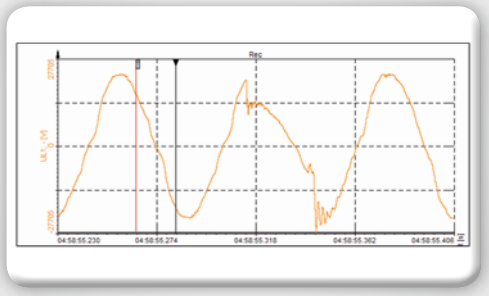
FFT & POWER QUALITY



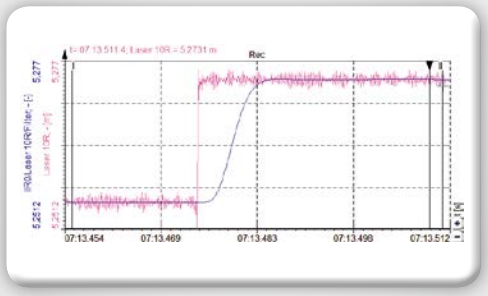
RECORDER / DATA LOGGER



TRANSIENT RECORDING



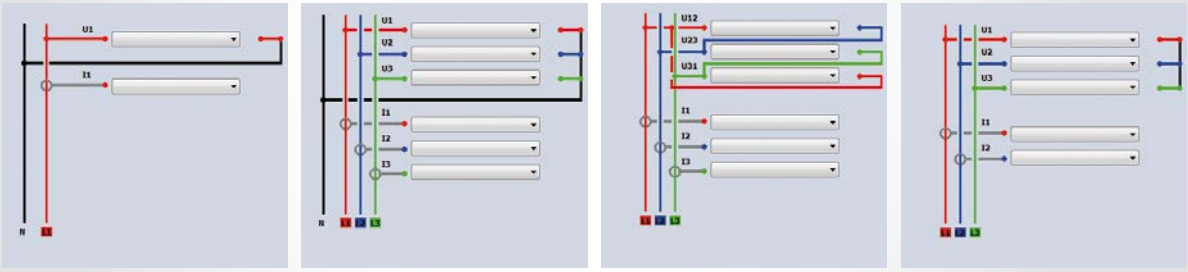
ANALYSIS, EXPORT & POST PROCESSING



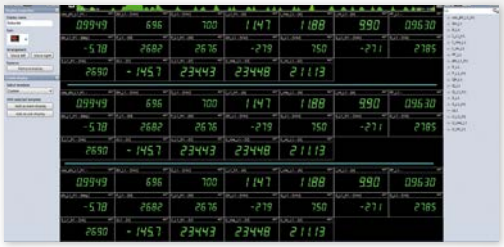
Power Analysis

WIRING SCHEMATICS

Different wiring schematics allow the power calculation for all possible connections. These are single phase, star connection, delta connection, V connection, Aron 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.

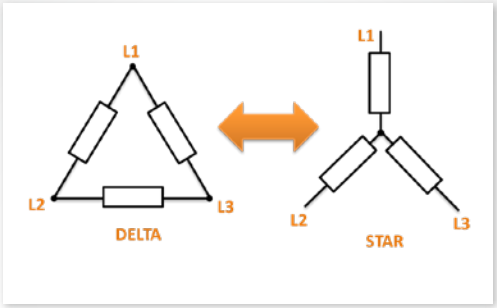


POWER CALCULATION



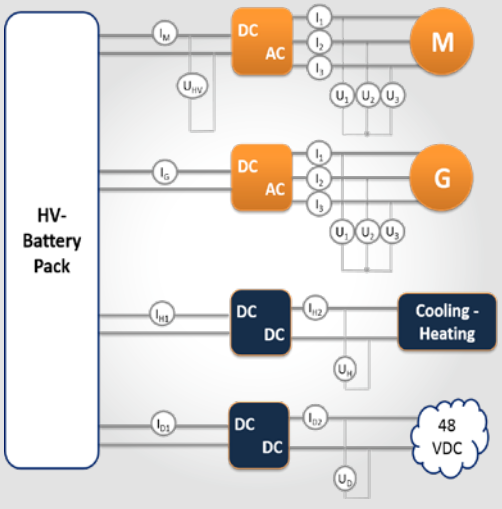
- *P, Q, S, D*
- *Cos φ, power factor*
- *P, Q, cos φ for each harmonic*

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*

MULTIPLE POWER CALCULATIONS



Example: *2x 3-phase AC Power* *6x DC Power*

It is possible to do a number of power analysis within just one device. For example with the DEWESoft® R8D 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.). Any additional mechanical values like torque, speed, noise, temperature and vibration can be captured and synchronously analysed.

Typical Configurations:

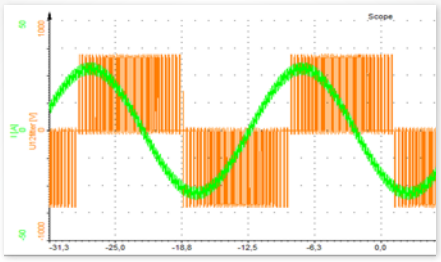
- *Motor & Inverter Measurement*
  3x 3-phase AC power (var. frequency)
- *E-Mobility*
  4x 3-phase AC power (var. frequency)
  6x DC power
- *Aircraft*
  5x 3-phase AC power (400 Hz)
  1x 1-phase AC power (50 Hz)
  5x DC power
- *Marine*
  7x 3-phase AC power (50 Hz)
  4x 1-phase AC power (50 Hz)
  1x DC power
- *Railway*
  1x 3-phase AC power (50 Hz)
  3x 1-phase AC power (16.7 Hz)
  3x DC power

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 the different instruments from DEWESoft® the values can be shown in several ways.

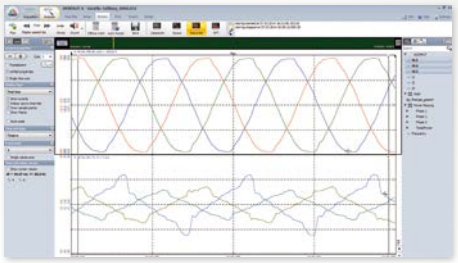
Possible line frequencies:
16.7 Hz & 25 Hz: Railway Sector, 50 Hz: Public Grid, 60 Hz: Public Grid, 400 Hz: Aerospace, 800 Hz: Aerospace,
Variable frequency: Inverter (from 0.5 Hz to 3 kHz).

FREQUENCY SOURCE



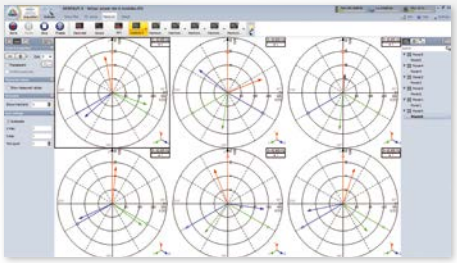
In DEWESoft® you can choose whether you use voltage, current or an external source as frequency source. This is a very helpful feature especially at inverter measurements. Due to the PWM modulated voltage signal the correct period time often can not be determined right. The current is much less distorted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

SCOPE



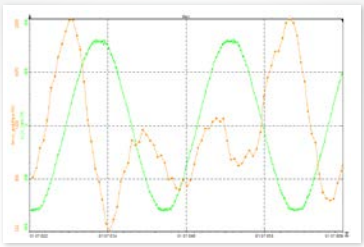
- *Selectable graphs*
- *U1, U2, U3, U12, U23, U31: Line to line and line to earth voltages are supported*
- *Up to 8 graphs in one diagram*
- *Zoom in and out are supported online*
- *Waveforms can be stored*

VECTOR SCOPE



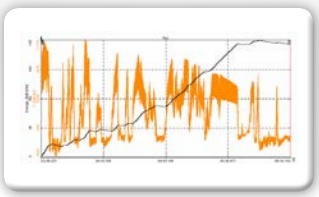
- *Vector scope for 3 phase systems*
- *Each individual harmonic can be shown*
- *More vector scopes can be displayed on one screen*
- *Different power systems can be shown on one screen*
- *With the „transparent" function direct comparisons of phasors are possible*

PERIOD VALUES



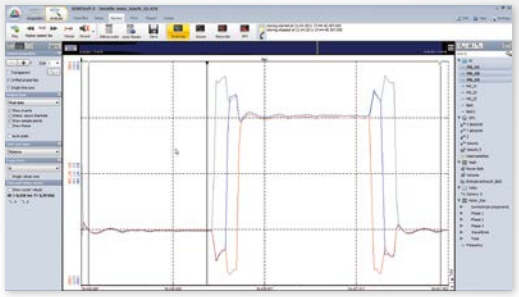
- *U, I, P, Q, S, PF for each phase and total*
- *Symmetrical Components (U, I, P, Q for positive-, negative- and zero sequence system)*
- *Definable Cycle Calculation (1/2, 1, 2 or 4 cycles)*
- *Overlap of up to 99 % (1ms sliding)*

RAW DATA STORING



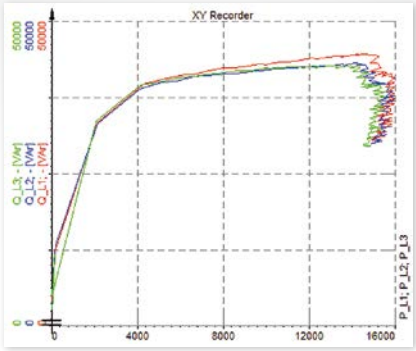
With a very specific data file structure we can write the channel setup, display setup, all the events, fast analog data and slow asynchronous data from different sources in a single file. For long term measurement DEWESoft® offers to roll-over the file automatically when certain file size is reached 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.

RECORDER



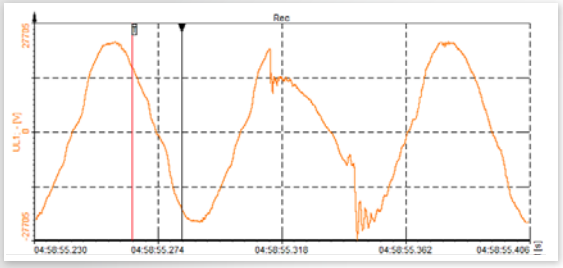
- *Recording of all parameters in individual intervals*
- *Individual screens can be defined*
- *Zoom in and out*
- *Storing fast (full sampling rate) or reduced (e.g. 600 sec.)*
- *Detailed zoom-in to pulse width!*

X/Y RECORDER



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

FAULT RECORDER & TRANSIENT RECORDER

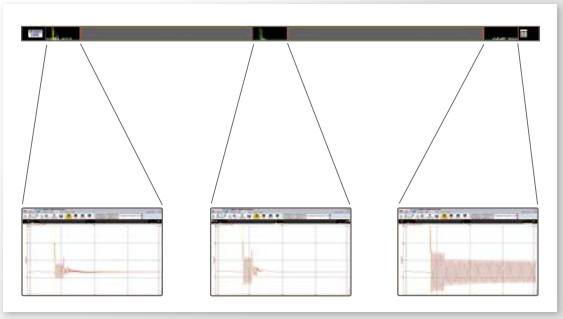


- *Trigger on all channels possible (analog, digital, power, math, etc.)*
- *Setting a trigger on all parameters of the power module!*
- *U, I, P, Q, S, D, cos φ, power factor, ...*
- *Each harmonic!*
- *Pos-, neg-, zero-sequence systems*
- *Very fast glitch detection (up to MS/s)*
- *Math. channels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

We can also use math formulas to create combined trigger conditions. When the trigger event happens, data is stored with the fast sampling rate (with pre- and post-time) while otherwise only reduced data (min, max, average, RMS) is stored. This reduces the file size in long-term measurements.

Trigger Types

- *Simple edge (either rising or falling slope)*
- *Window trigger (two levels; entering or leaving logic)*
- *Pulsewidth trigger (longer or shorter than duration logic)*
- *Window and Pulsewidth (completely selectable as above)*
- *Slope Trigger (rising or falling slope with steepness selection)*



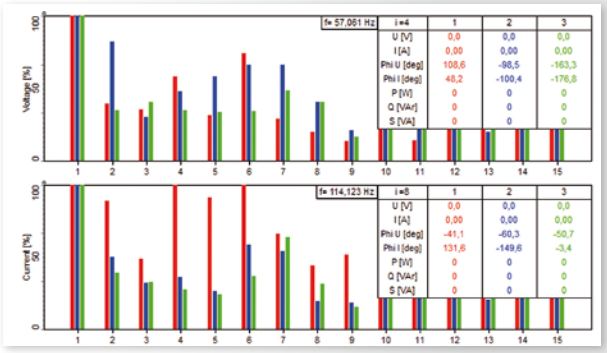
CALIBRATION/ACCURACY

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, rogowsky coil, transformer or which sensor ever is used.

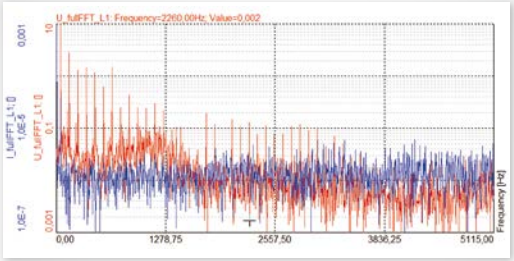
Power Quality Analysis

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 to 3000th order*
- *Variable sidebands and half sidebands 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 substractable*

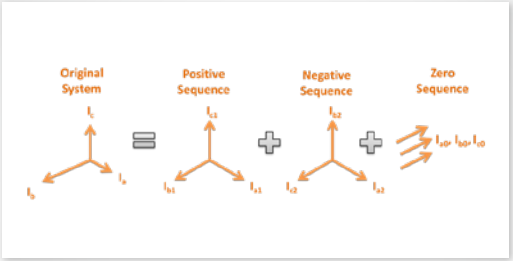


FULL FFT - FREQUENCY ANALYSIS



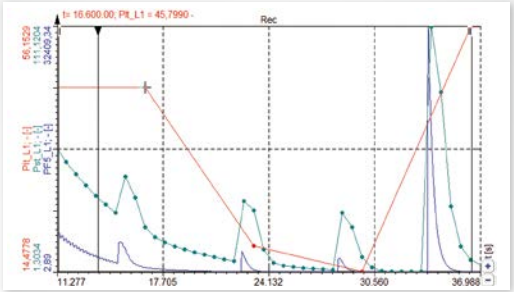
- *In addition to the harmonics FFT a full frequency based FFT is available.*
- *All frequencies can be analyzed with this function*
- *Trigger on FFT patterns*
- *Definable filters (hanning, haming, flat top, rectangle, . . .)*

SYMMETRICAL COMPONENTS



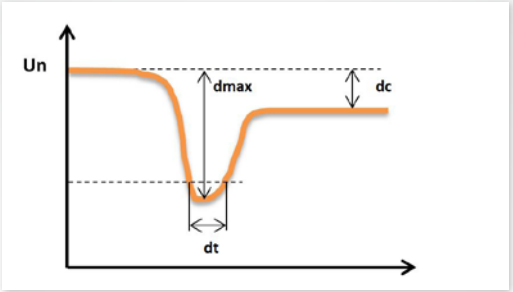
- *U, I, P, Q, S*
- *Positive-, Negative- and Zero sequence system*
- *Period values*
- *Unbalance related to fundamental part or total spectrum*
- *More than 50 different parameters*

FLICKER & FLICKER EMISSION



- *According to EN 61000-4-15*
- *PST and PLT with flexible intervals*
- *Individual recalculation intervals*
- *Pinst , du, dumax , duduration*
- *Flicker emission (current flicker)*

RAPID VOLTAGE CHANGES



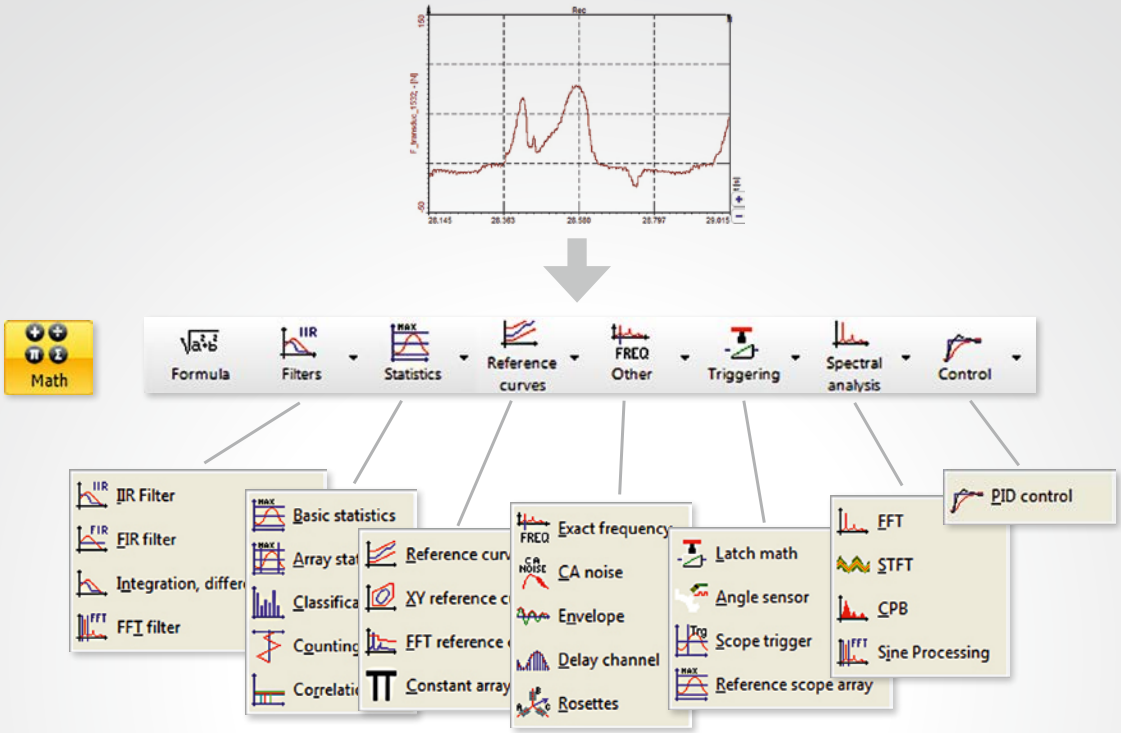
- *According to IEC 61000-4-15*
- *Du, dmax and duduration*

Math Library

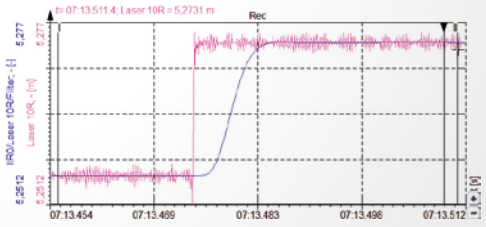
DATA PROCESSING CAPABILITIES

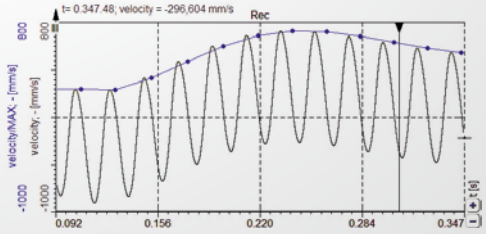
Even though the main focus of DEWESoft® is on data acquisition and storage, it also offers powerful analysis features. The powerful math library covers a couple of functions which makes data analysis directly in DEWESoft® and even direct during measurement possible.
Imagine having a big data file of 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 condition)*
- *Angle sensor math (convert analog input signal from tacho probe to freq. + angle)*
- *Scope trigger*
- *Spectral Analysis (FFT, STFT, CPB, SineProcessing)*

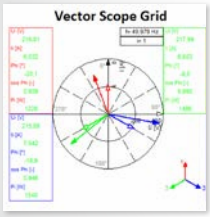




Analyse & Publish

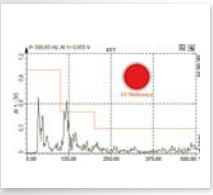
POST PROCESSING

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.



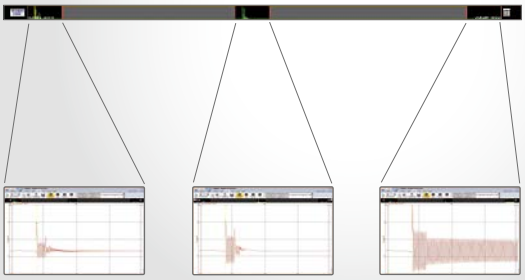
FILE PREVIEW - ANALYSIS MODE

One of the most outstanding feature 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.



Grandview®

Enhanced freeze mode (Grandview®) allows user to review stored data from start of measurement without interrupting data acquisition and storing process. User is able to zoom into any region of data already stored on disk during the measurement and review any type of signal including video, which makes (long term) measurements easier to manage.



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. DEWESoft® does not only show the data, but it can also replay the data through sound card. DEWESoft® can also replay data of any channels through SIRIUS® AO8.

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®
- Diadem®
- UNV
- FAMOS
- NSOFT
- Sony®
- RPC III
- Comtrade®
- WAV
- Google Earth®
- KML
- BWF
- ATI
- SDF
- WFT
- CSV
- TDM
- TDF
- and more ...

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

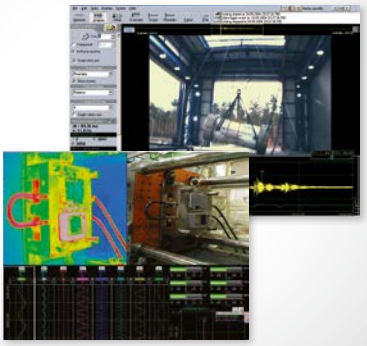
REPORTS

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.

Interfaces

VIDEO INPUT

Synchronized video acquisition from web-, thermo- and high speed cameras

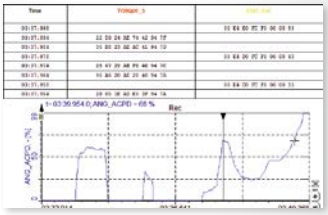


For applications requiring video which is truly synchronized to the dynamic sample rate, there is support for DS-Cameras. A high quality image with automatic shutter speed (selectable) is controlled directly by the A/D card, which generates a pulse to drive the camera. The result is a stunning correlation 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

CAN, OBDII on CAN, J1939 and J1587 interface support



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.

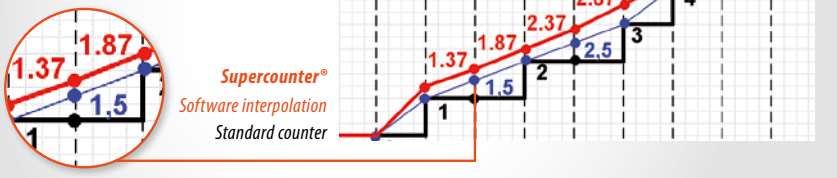
GPS INTERFACES

Advanced GPS support and capabilites

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

From basic counting to advanced counter modes



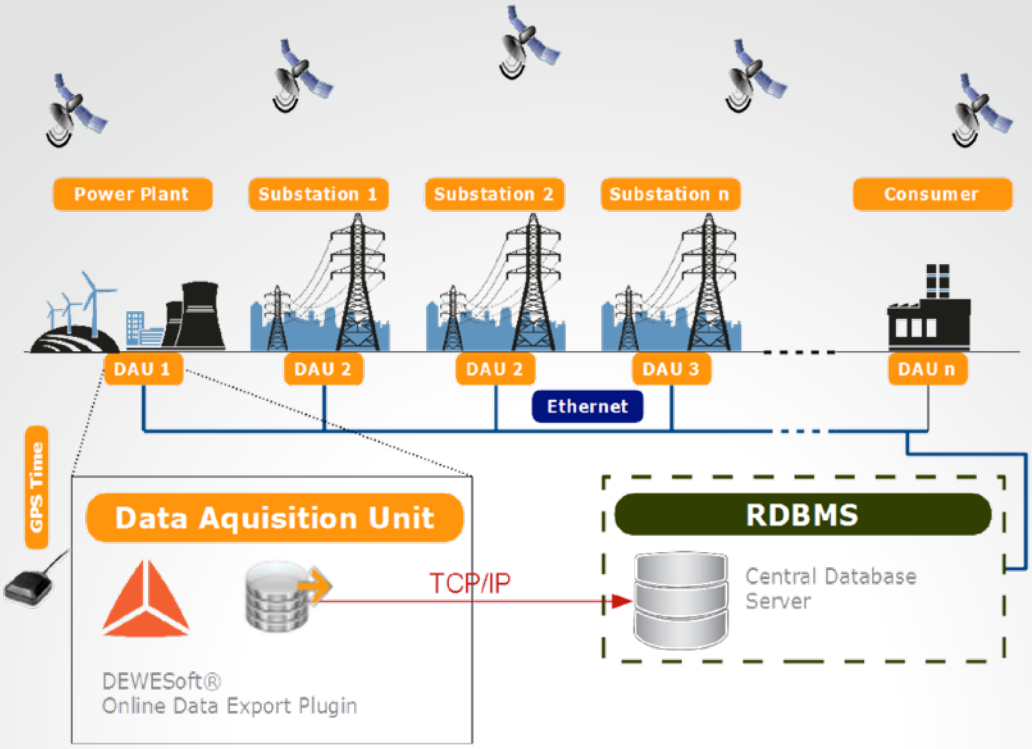
The so called Supercounters® (DEWE-43A, SIRIUS®, etc…) allow a very precise timing and counting measurement. The counting is performed on an internal 102.4 MHz time base, no matter which sampling rate is currently used.

Database Storing

The Online Data Export (ODE) plugin can export DEWESoft® measurement data during storing directly to a database or to .csv files (that can later be imported into the database).

The ODE plugin is well suited for real-time monitoring of substations, power plants, industries, etc. Beside the RMS values for voltage and current also all power quality parameters like harmonics, THD, flicker, unbalance etc. can be stored in the database.

The transient recording functionality allows to store the analogue signal of voltage and current at extraordinary system conditions (over- and under voltage, frequency deviations, etc.).



Scope:
The ODE plugin will store the measurement into the database. The customer may use any visualization or analysis tool that can access the data in the database. DEWESoft® does not offer any visualisation or analysis features or programs. Also database related tasks like installation and maintenance are not provided and supported by DEWESoft®.

Supported Database Systems
Currently the ODE plugin supports MySQL® and Microsoft SQL Server® databases.
Other databases (e.g. Oracle®, PostgreSQL®, ..) can also be supported on customer demand (please ask our sales department for a quotation).

Power Grid Monitoring
- *Voltage, Current*
- *Active-, Reactive- and Apparent Power*
- *Frequency*

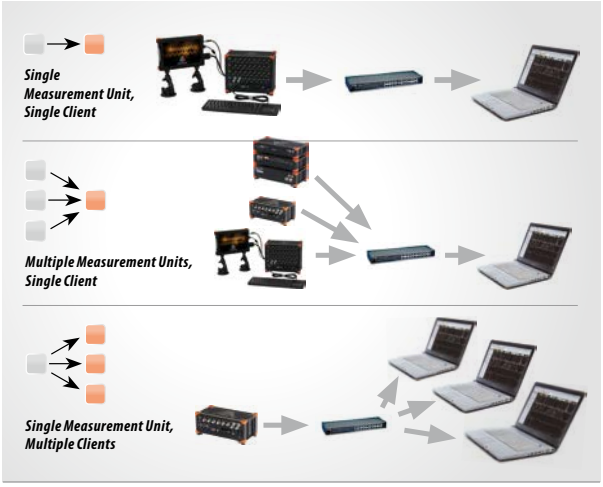
Power Quality Monitoring
- *Harmonics, Interharmonics, THD*
- *Flicker, Flicker emission*
- *Unbalance, Symmetrical Components*

Power Fault Recording
- *Transients - Voltage, Current*
- *Over- and Undervoltage*
- *Voltage interruptions, fluctuations, etc.*

NET Option

With the OPT-NET option your measurement system can be controlled remotely with ease of use you couldn't imagine before. OPT-NET also serves as the centre of Distributed Data Acquisition systems where you have multiple systems located either together or scattered across an entire continent.

IRIG and GPS time will take care that data will stay synchronized, no matter how long the acquisition runs. OPTNET offers three basic modes of operation (1:1 mode, x:1 mode, 1:x mode). With these three modes almost any application can be covered. From single channel expansions over remote control to distributed measurements over hundreds of kilometers - everything is possible.



Online Training

PRO training is a NEW learning platform, made for measurement professionals and those who would like to become one. It is easy to use, available at an time and based on How to use DEWESoft®. It's free of charge and accessible to anyone who wants to learn. Your effort in each course is also rewarded. Curious? Visit pro.dewesoft.com and take a look

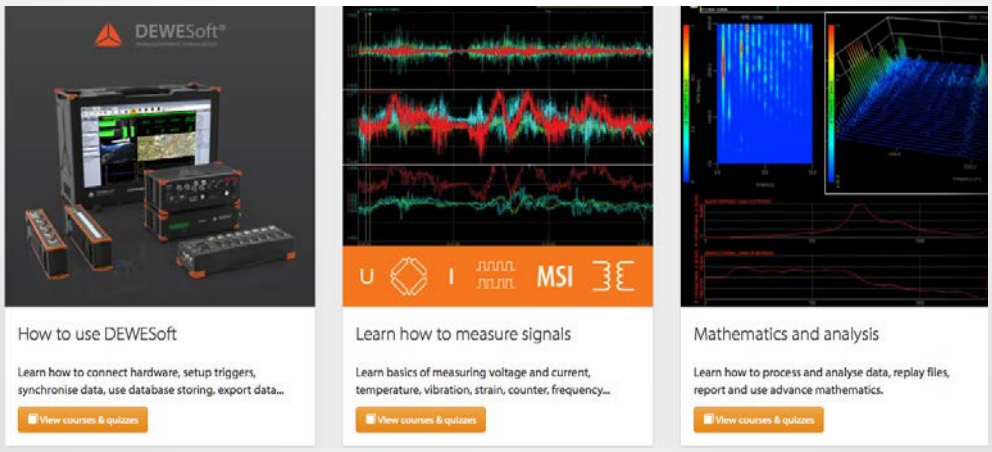
Special Power Courses

Voltage Measurement: *Learn how to measure voltage from very low voltages (µV) up to very high voltages (kV). Learn everything about voltage amplifiers, voltage probes and when high sampling rates are necessary*

Current Measurement: *Learn how to measure currents via a shunt, a rogowsky coil, a iron-core clamp, a hall-compensated clamp, a zero-fluxtransducer and get information about the technology beyond. Learn how to achieve highest accuracy for current measurement and to use the right transducers for your application.*

Power Analysis: *Learn how to measure the electrical power for different applications (motor, inverter, grid measurement) and at different wiring schematics (DC, 1 to 12phase AC) and. Learn how the more than 100 values in the power module are calculated and how to optimally visualize and analyse them.*

Power Quality Analysis: *Learn what harmonics, interharmonics and higher-frequency components are. Learn how to measure unbalance, symmetrical components, distortion and flicker.*



Applications

Power Analysis

MOTOR

INVERTER

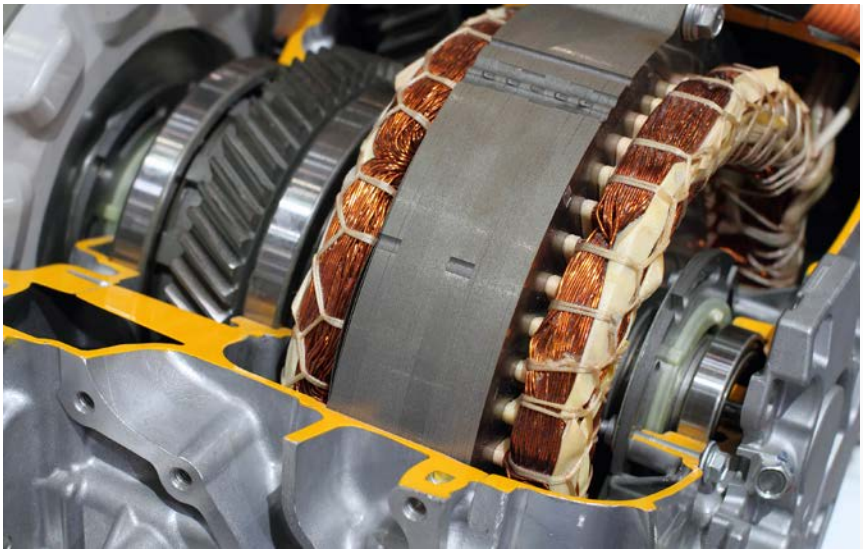
TRANSFORMER

STANDBY-POWER

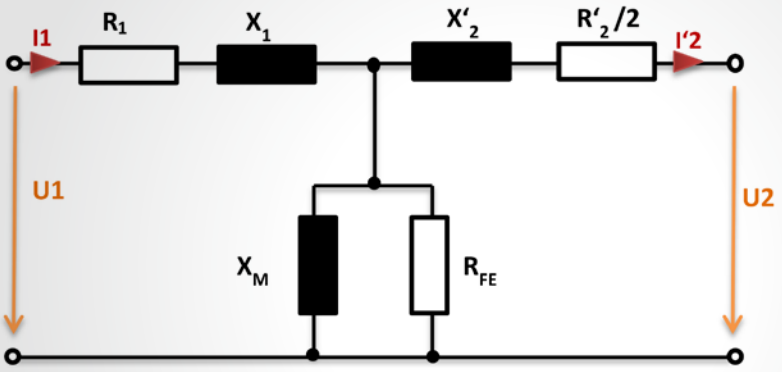
LIGHTING

EQUIPMENT

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.



R_{FE} ...Iron Losses
R_{CU1}, R_{CU2}... Copper Losses
X_M...Main inductance
X_1, X_2... Stray Inductances

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

HIGHLIGHTS

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

TYPICAL CONFIGURATION

SIRIUS® R2D

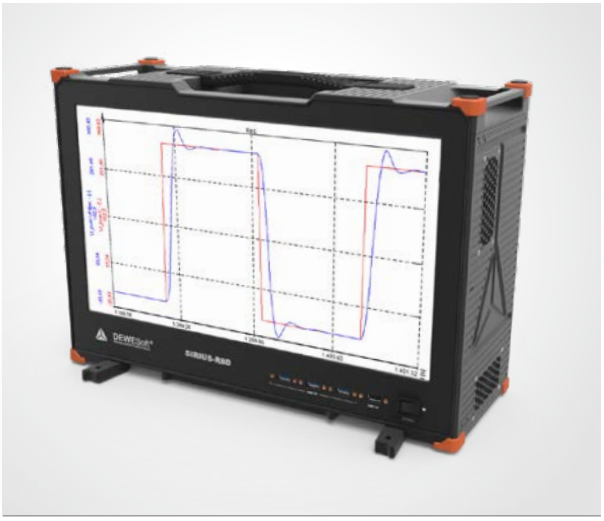
4x Voltage
4x Current
1x Torque
1x Speed
Sound-Level, Vibration

Inverter Testing

TYPE OF INVERTER	INPUT	OUTPUT
Industry Inverter	1 to 3~ AC	3~ AC
Electric Vehicle Inverter	DC	3 to 12~ AC
Photovoltaic Inverter	DC	1 to 3~ AC
Wind Power Inverter	3~ AC	3~ AC
Electric Two-Wheeler	DC	1 to 12~ AC

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 behaviour 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 capacities). 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*

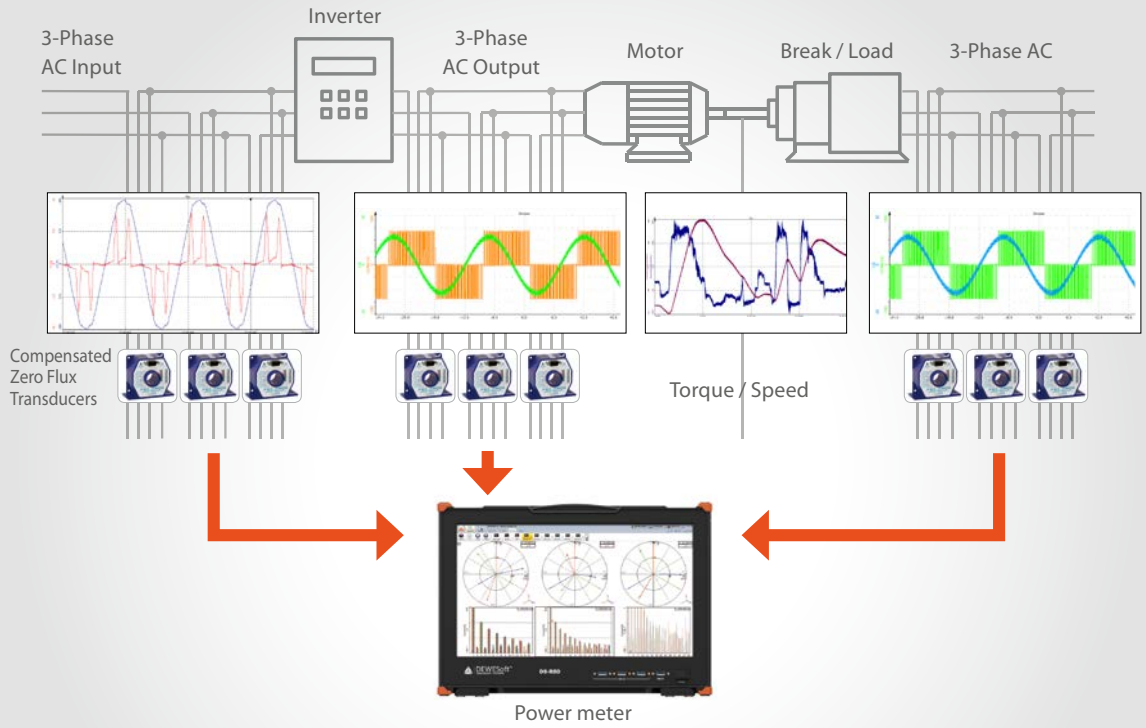
TYPICAL CONFIGURATION

SIRIUS® R8D

8x Voltage
8x Current
8x Power Supply for current transducer

Motor and Inverter Testing

TYPICAL ENGINE TEST BED APPLICATION



Combined motor and inverter testing is the Power Analyzers king's class and affords a high number of input channels for voltage and current measurement and completely synchronized data acquisition. The DEWESoft® R8D 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/25Hz/50Hz/60Hz/400Hz/800Hz/variable frequency)*
- *Analyzing 1-12 phase motors*
- *Raw data analysis, Transient recording, Data logging, Scope, Vector Scope*
- *Additional measurements like speed, torque, temperature, etc.*

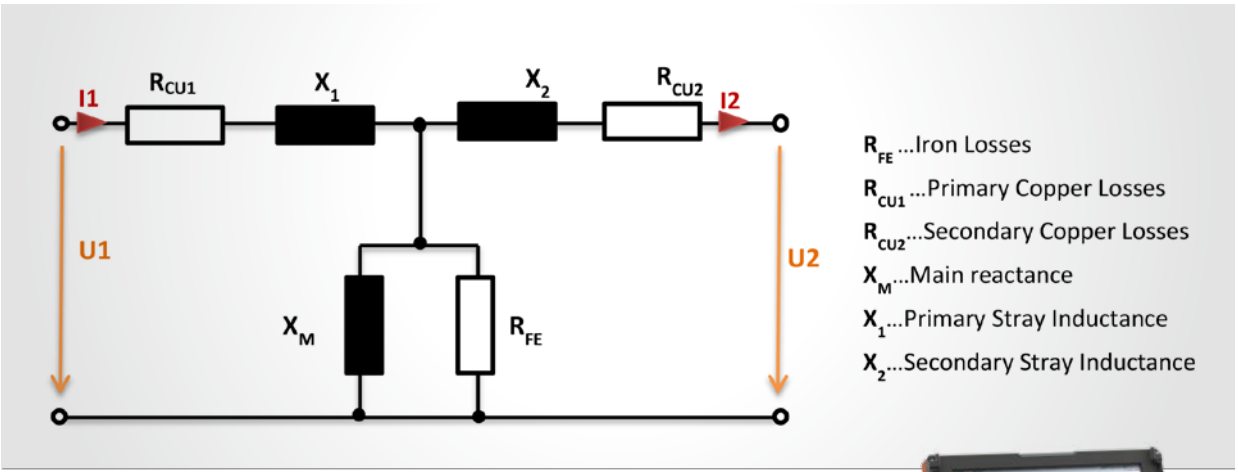
TYPICAL CONFIGURATION

SIRIUS® R8D

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 Analyzer 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 behaviour 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 Analyzer 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 60551 of the transformer. This is full range testing of power transformers, that you have never experienced before.



HIGHLIGHTS

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

TYPICAL CONFIGURATION

SIRIUS® R2DB

8x Voltage
8x Current
3x Temperature
Sound
Additional sensor calibration

Standby-Power

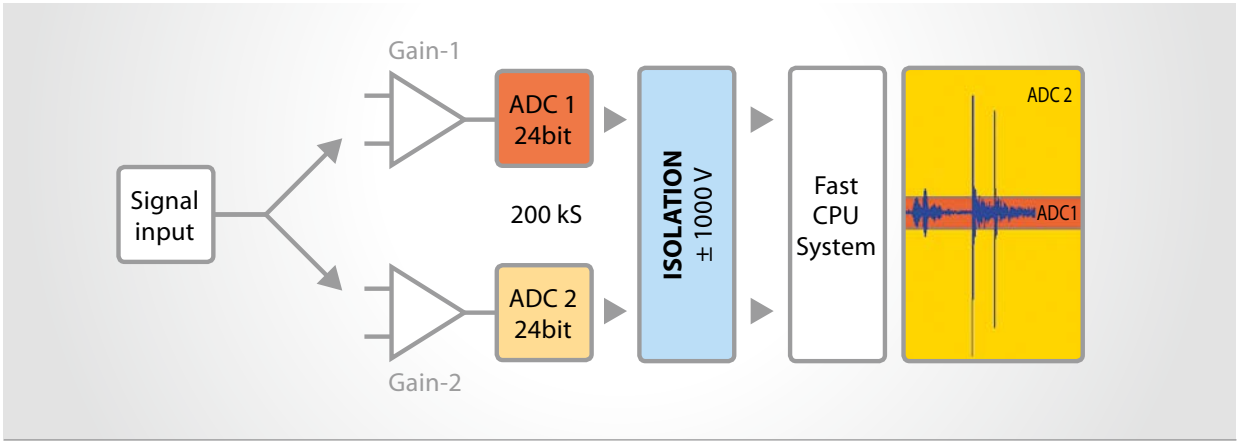
ACCORDING TO IEC62301

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 DUALCOREADC® 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 DUALCOREADC® technology uses two 24-bit

AD converters in parallel: One of them 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

- *DUALCOREADC® measurement for low currents with high Crest factor*
- *Harmonics and THD*
- *Data Logging*

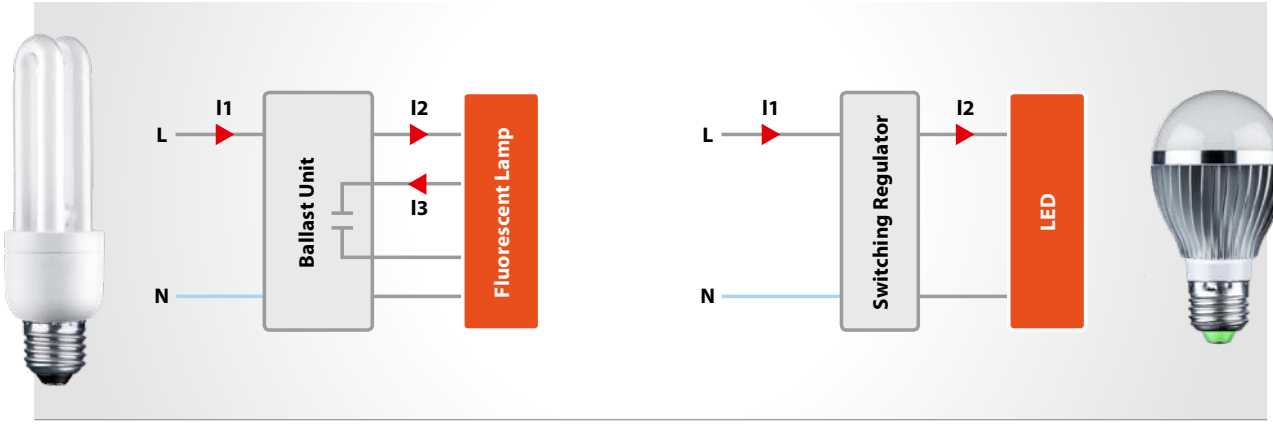
TYPICAL CONFIGURATION

SIRIUS® DUALCOREADC®

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 used which are working with switching frequencies up to 150 kHz. The high Sample Rate (1 MS/s) of the DEWESoft® Power Analyzer 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.



HIGHLIGHTS

- *High switching frequencies – high bandwidth*
- *Harmonics, THD, Flicker*
- *Energy, Efficiency*

TYPICAL CONFIGURATION

SIRIUS® POWER

3x Voltage
3x Current
1x Low Voltage input
for luminance meter

Equipment Testing

MAINTENANCE

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*
- *Castor 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

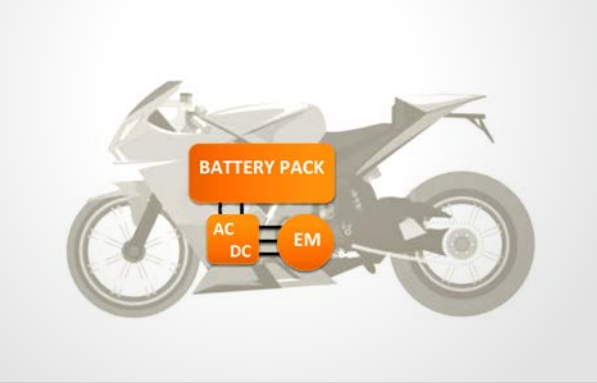
ELECTRIC MOTORCYCLE

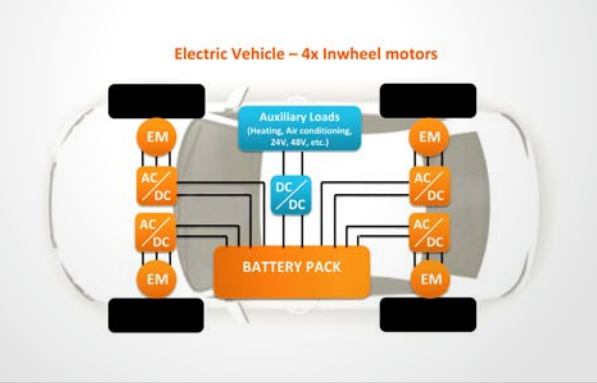
BATTERY TESTING

CHARGING ANALYSIS

Electric Vehicle Testing

The Power Analysis module allows measuring every kind of motor (1-12 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 Analyzer 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.



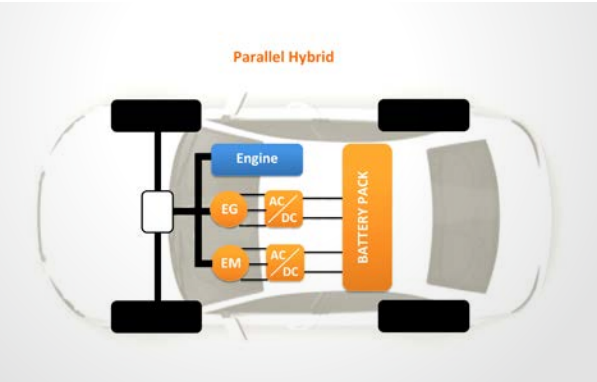


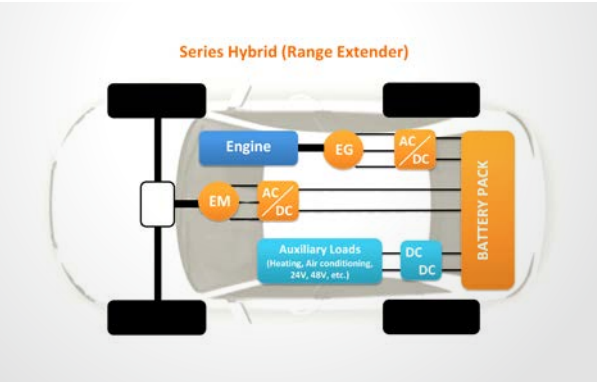
Hybrid Testing

COMBINED POWER AND COMBUSTION ANALYSIS

The Combustion Analysis (CA) module allows detailed analysis of the combustion process. The analysis is perfectly synchronised to the power analysis. The DEWESoft® Combustion Analyzer enables the user to display and compare measurement data using several different diagrams like, the pV-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), start/end of injection (SOI, EOI), 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

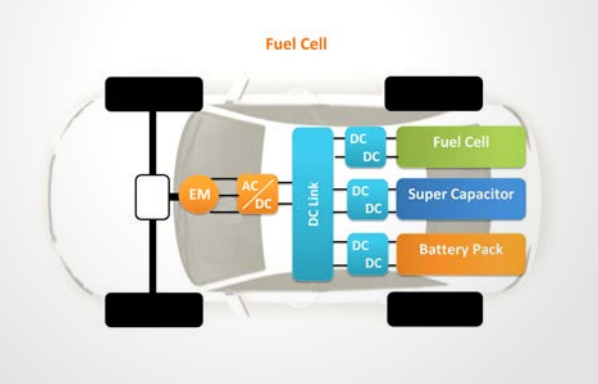
knocking detection and combustion noise algorithm. The basis for all of these calculations are precise angle position data and cylinder pressure measurement. DEWESoft® provides the perfect hardware for this: the galvanically isolated SIRIUSi charge inputs (with up to 24Bit resolution) are in perfect sync to the DEWESoft® Supercounters®. This allows perfect analysis of Hybrid cars already during driving.





Hydrogen testing

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.



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 Analyzer system can be used for the development of batterys (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.).

Charging Analysis

CONDUCTIVE AND INDUCTIVE CHARGING (WIRELESS POWER TRANSFER)

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 Sampling Rate (1 MS/s) and the possibility to measure AC and DC currents of the DEWESoft® Power Analyzer fulfills all requirements for testing both, conductive and inductive charging.

Test Bed Application
AND IN-VEHICLE USE

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.

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

Testbench
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 DEWE-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.

Additional Parameters

The modular hardware design, which offers a wide range of input amplifiers, in combination with the flexible software, makes it possible to acquire a lot of additional data: e.g. torque, speed, temperature, pressure, flow rate, video, GPS data (position, acceleration, speed), vehicle bus data (e.g. CAN, OBDII, ...), and many more. All these additional data sources are synchronised to the Power Analysis signal, even when they use different sampling rates. The unique combination of time-, angle- and frequency-domain data acquisition in one system makes it possible to run multiple analysis functions concurrently: e.g. order tracking, torsional vibration, power and many others.

HIGHLIGHTS

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

TYPICAL CONFIGURATION

SIRIUS® R8D

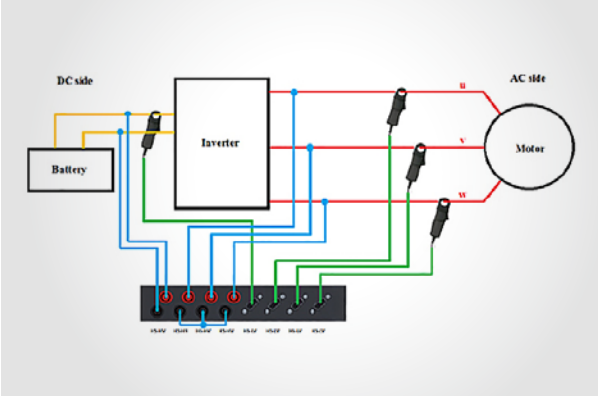
14x Voltage
17x Current
1x Torque
1x Speed
Additional inputs
(analogue, digital, counter, GPS, CAN, video, etc.)

Exemplary E-Mobility

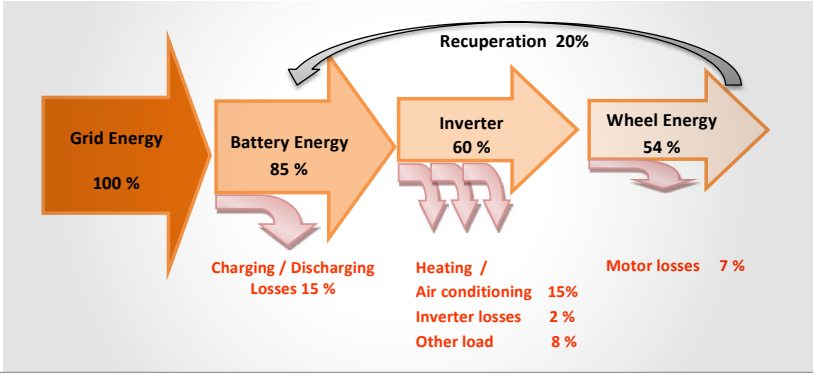
MEASUREMENT RESULTS

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.

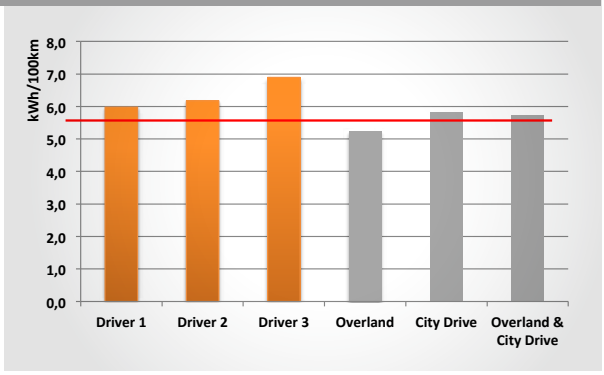


Some inverters of electric vehicles (e.g. bus) are working at different switching frequencies to increase the efficiency in different driving situations (city / overland drive). With the DEWESoft® Math library it is possible to filter out the currently used switching frequency and automatically do the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



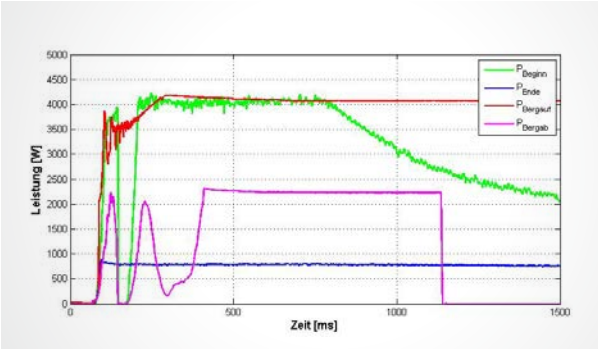
ANALYZING DIFFERENT DRIVING SITUATIONS

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 Analyzer 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 behaviour of different test drivers on the same test-track (left) and the analysis at different driving situations (right). The acceleration behaviour 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.



CHARGING PROFILE, CHARGING TIME AND EFFICIENCY

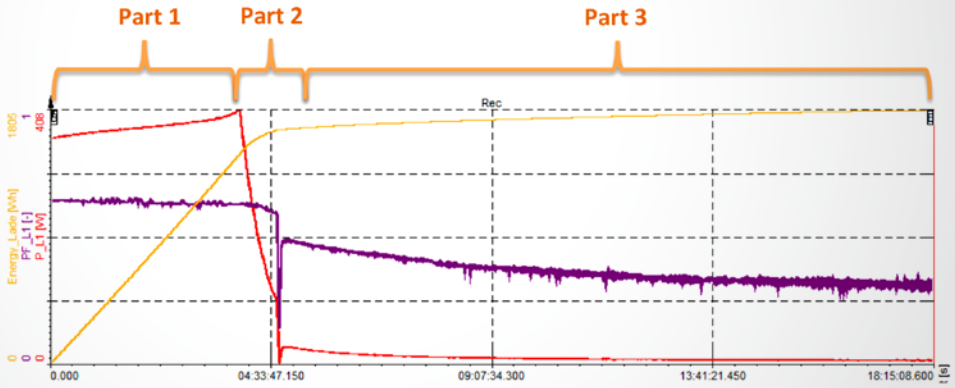
The data logging capability of the DEWESoft® Power Analyzer allows recording the complete charging process.

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

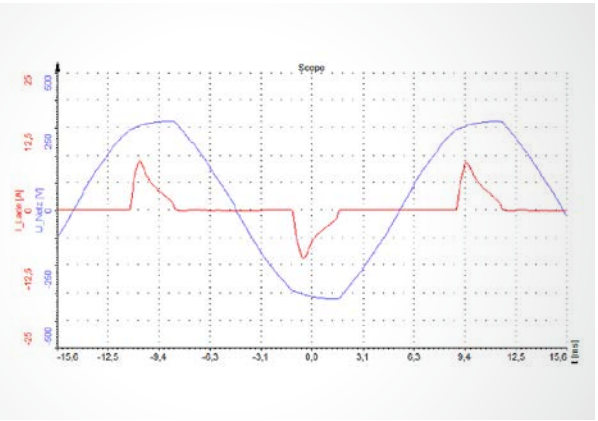
Charging Part 3: Last charging part with low power. Within 14 hours battery is fully charged.

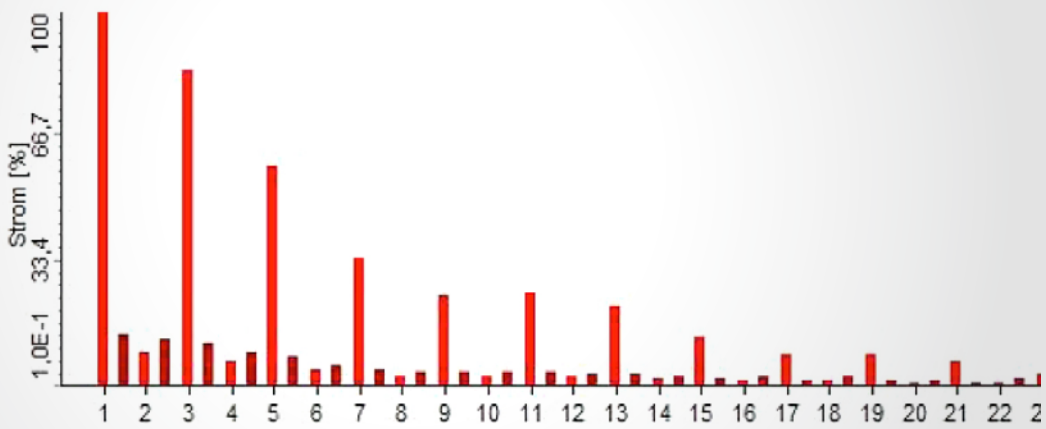


EMC TESTS OF CHARGING DEVICES ACCORDING TO IEC61000-3-2 AND IEC 61851

DEWESoft® supports EMC conformity tests of charging devices according to IEC 61000-3-2. The Power Quality Library automatically calculates all necessary parameters. Instruments like the Harmonic FFT, the Harmonic table, Harmonic reference curve and the scope function ensure fast and reliable analysis.

Harmonic order	Frequency [Hz]	Current [A]	Current Limit [A]
1	50	1,82	-
3	150	1,42	2,3
5	250	0,95	1,14
7	350	0,58	0,77
9	450	0,45	0,4
11	550	0,44	0,33
13	650	0,36	0,21
15	750	0,22	0,15





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*

- *Combustion analysis*
- *Torsional and rotational vibration*
- *Order tracking*

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

- *Crash tests*
- *Structural testing*

- *Climate Testing*
- *Air-Conditioning Testing*

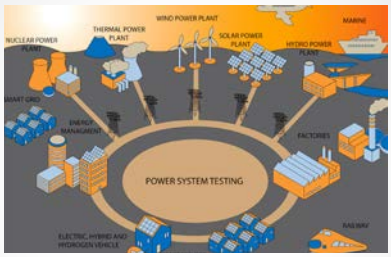
Applications

Power Quality Analysis & Power System Testing

POWER QUALITY ANALYSIS

RENEWABLE TESTING

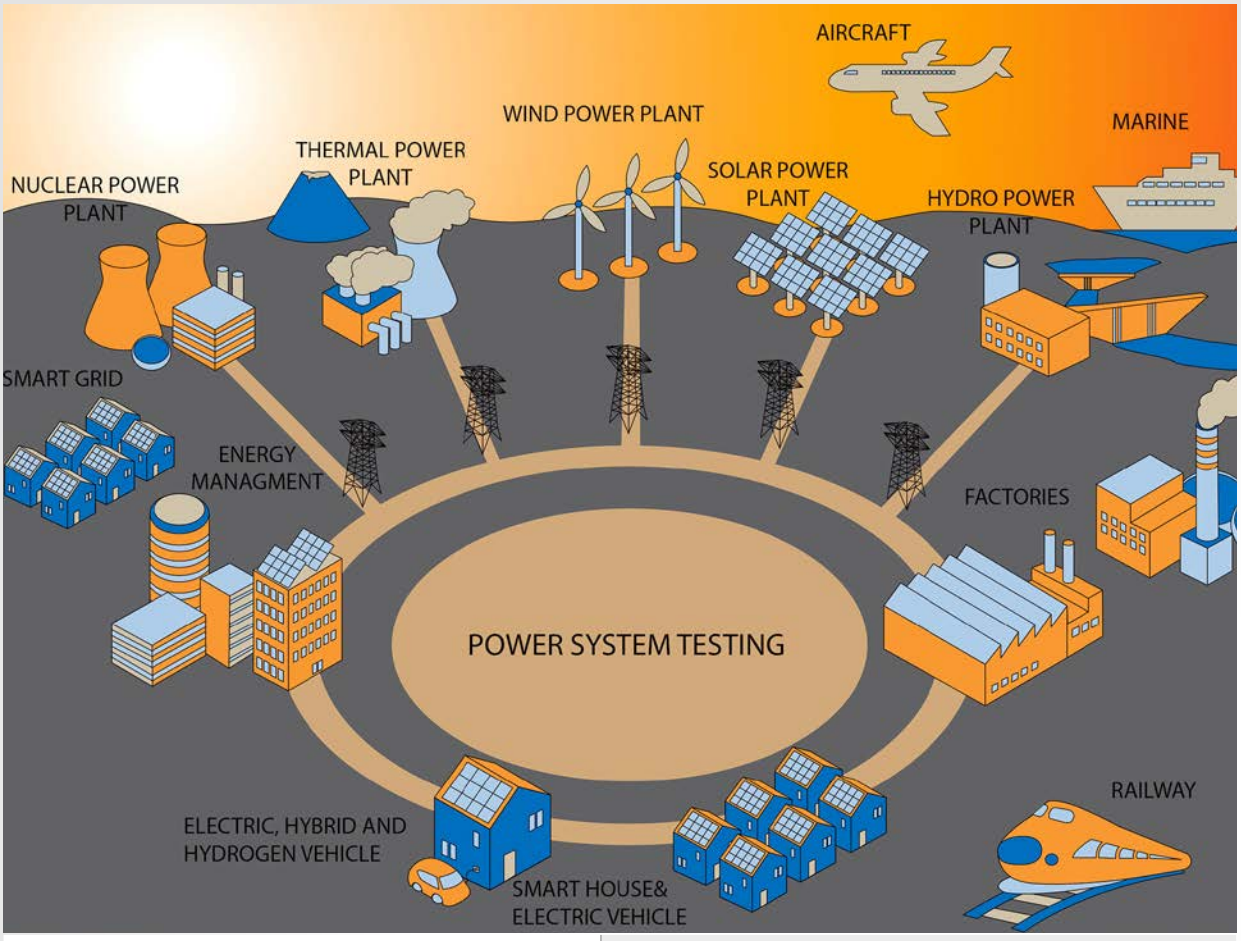
SMART GRID



RAILWAY TESTING

AIRCRAFT TESTING

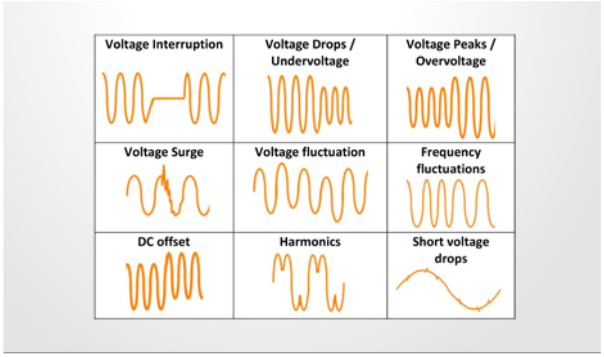
MARINE TESTING



POWER GRID	*Fault & Transient Recording* *Power Quality Analysis (IEEE 1159, EN50160)*
TRANSFORMER	*Efficiency Analysis (IEC 60076-1)* *No-load and short circuit testing* *Vibration, Noise (see Dynamic Signal Analysis brochure)*
WIND, SOLAR AND CHP	*Power Performance (IEC 61400-12)* *Power Quality (IEC 61400-21 / FGW-TR3)* *Active & Reactive Power (FGW-TR3)* *Behaviour at faults (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 Vibration (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)* *Harmonic Analysis*
MARINE	*Power System Testing* *Fault & Transient Recording* *Hybrid Testing (Combustion & Power)*
RAILWAY	*Power System Testing (AC & DC rails)* *Power Quality Analysis* *Fault & Transient Recording* *Short-Circuit Analysis* *Pantograph & Current Shoe Testing*
E-MOBILITY	*Electric Two Wheeler* *Electric Vehicle* *Hybrid Vehicle (series and parallel)* *Hydrogen Vehicle*
EQUIPMENT TESTING	*Fans and pumps testing* *Circuit Breaker testing* *Filter analysis* *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*

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 Analyzer 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 mathematic 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).



HIGHLIGHTS

- *High sampling rate up to 1 MS/s*
- *Storing raw data*
- *Triggering on different channels (analogue, digital, math, power, power quality etc.)*
- *Analysis at all line frequencies (16.7Hz, 50Hz, 60Hz, etc.)*

TYPICAL CONFIGURATION

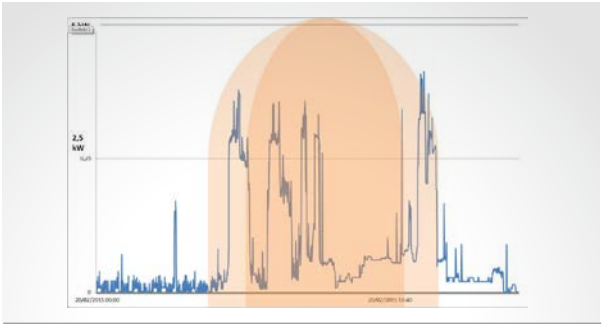
SIRIUS® R3

12x Voltage
12x 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, control) 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 increasing the number of renewable power plants in the grid. Designing this process and the equipment for Smart grids needs comprehensive testing. The DEWESoft® Power Analyzer allows measuring the power generation and consumption at multiple points in the grid (distributed measurement) and provides the basis for designing Smart grids.
Energy Management includes the planning and the operation of energy production and energy consumption units. The objective of Energy management is optimizing the energy consumption of whole companies, factories etc. This includes activities to reduce the overall energy consumption, to use more efficient equipment or technologies and finally reduce the costs. The DEWESoft® Power Analyzer and the possibility 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.



HIGHLIGHTS

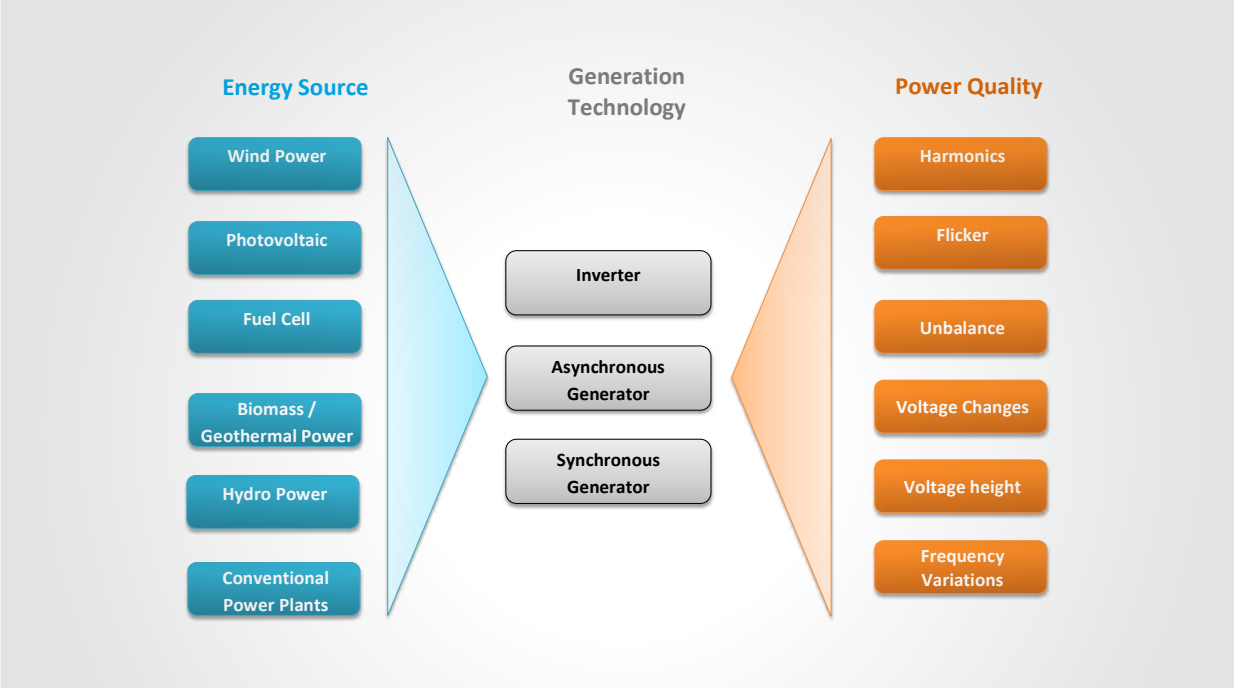
- *Power & efficiency analysis*
- *Multiple power analysis*
- *Interaction between power generation & consumption Distributed Measurement System*

TYPICAL CONFIGURATION

SIRIUS® R8D

4x Voltage
16x Current

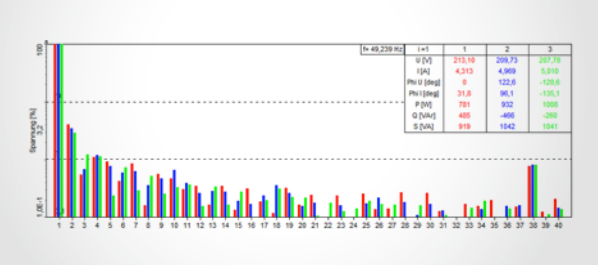
Power Quality Analysis



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.
The DEWESoft® Power Analyzer is able to measure all of these parameters according to IEC 61000-4-30 Class A. In comparision to other Power Quality Analyzers it's possible to do more detailed analysis (e.g. raw data storing, behaviour at faults, calculation of additional parameters etc.).

HARMONIC ANALYSIS

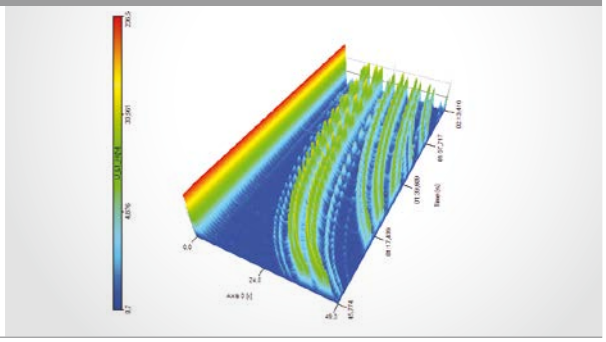
Harmonics are integer multiples of the fundamental frequency (e.g. 50 Hz) and cause a distortion in voltage and current of the original waveform. Harmonic voltages and currents caused by non-sinusoidal loads can affect operation and lifetime of electrical equipment and devices. Harmonic frequencies in 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.

FFT WATERFALL ANALYSIS

Beside the FFT analysis, the harmonic FFT analysis it's also possiblt to do a 2D / 3D-FFT Waterfallanalysis. This visualisation possibility is especially useful for analysis at variable drives. For exampel at the runup of an inverter you will very nicely see how harmonic sidebands grow up (see picture: Runup of a inverter of a traction drive from 0 to 150 Hz). The visualisation can be linear or logarithmic, 2D or 3D or sorted by harmonic order or frequency.



FLICKER AND FLICKER EMISSION

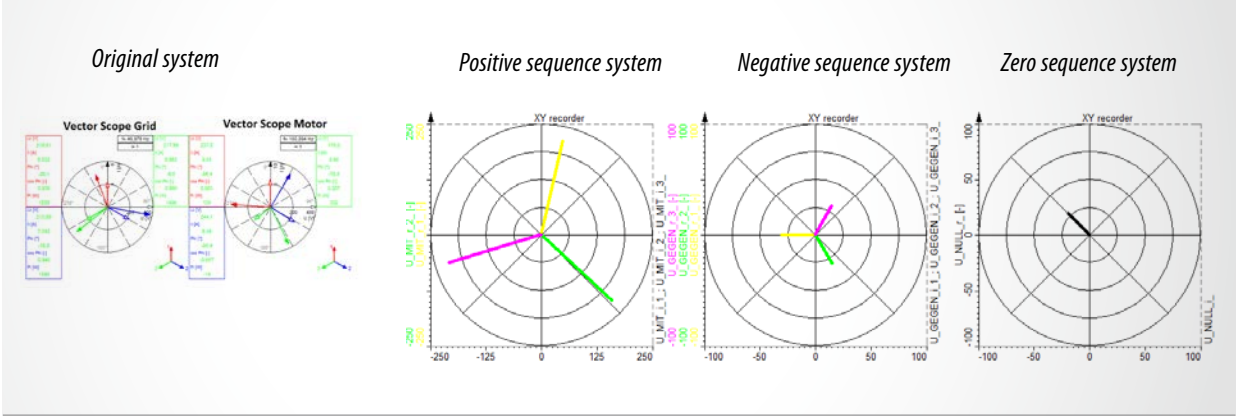
Flicker is a term for the fluctuations (repeated variations) of voltage. Flashing light bulbs are indicators for a high flicker exposure. Flicker is especially present at grids with a low short-circuit resistance and is caused by the frequent connection and disconnection (e.g. heat pumps, rolling mills, etc.) of loads which affectsthe voltage. A high level of flicker is perceived as psychologically irritating and can be harmful to people. The DEWESoft® Power Analyzer allows to measure all Flicker parameters according to IEC 61000-4-15.
The Flicker emission calculation is implemented according to IEC 61400-21 and allows the evaluation of flicker emission in to 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.).

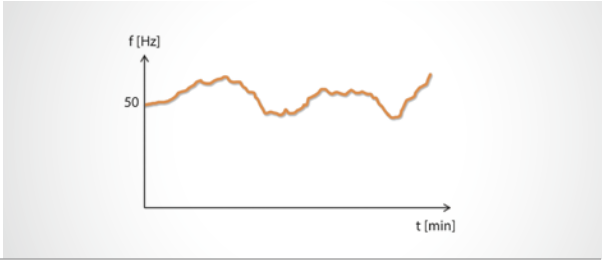
UNBALANCE - SYMMETRICAL COMPONENTS

Unbalance means that the voltages (U1, U2, U3) or/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 Analyzer 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's 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 Analyzer can be used for frequency monitoring and for testing the frequency behaviour of power generation units at development (see Renewable testing).



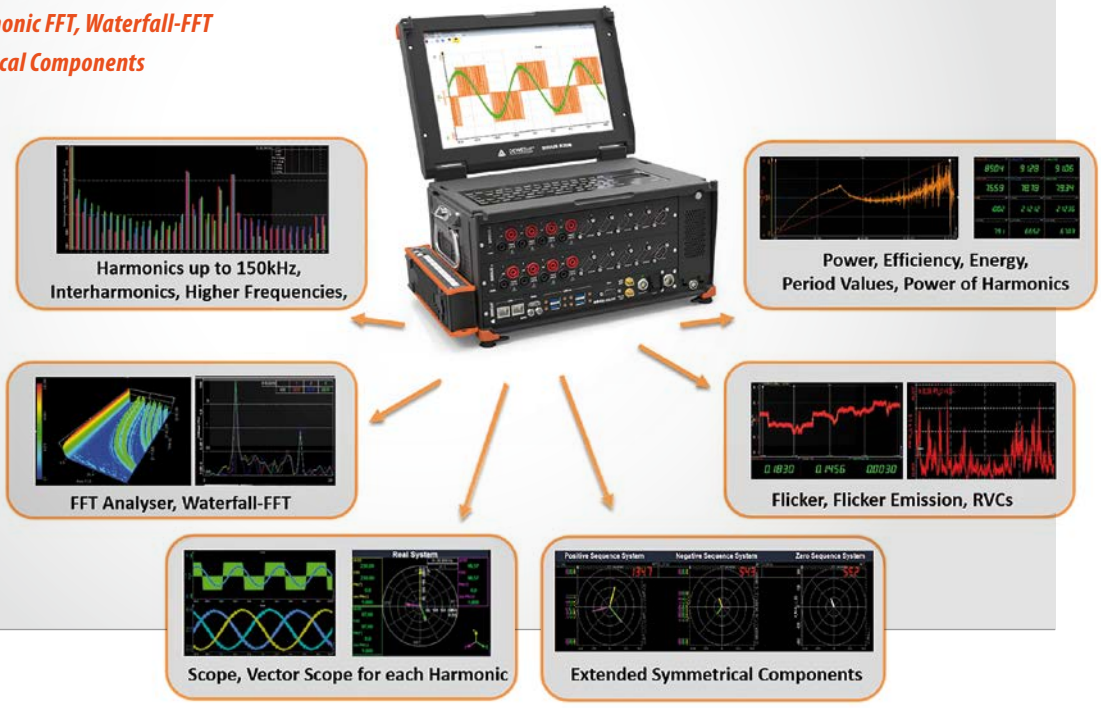
OVERVIEW POWER QUALITY STANDARDS

The DEWESoft® measurement instruments fullfill all requirements of Power Quality standards and can be used for a wide range of applications. The following table shows some of thies Power Quality standards.

IEC 61000-4-30, IEC 61000-4-7, IEC61000-4-15	Requirements for Power Quality Analyzers, Calculation of Harmonics, Flicker etc.
EN50160, EN50163, IEE519, IEC 61000-2-4, etc.	Power Quality limits of public grid, industries and railway applications
IEC 61400-21, IEC61400-12, FGW-TR3, BDEW, VDE-AR4105 etc.	Power Quality Analysis of Renewables
IEC 61000-3-3, IEC61000-3-11	EMC of voltage changes and Flicker
IEC 61000-3-2, IEC 61000-3-12	EMC of harmonics current

HIGHLIGHTS POWER QUALITY ANALYSIS

- *Harmonics & THD up to 150 kHz*
- *Interharmonics & Higher Frequencies*
- *Flicker, Flicker Emission, RVCs*
- *FFT, Harmonic FFT, Waterfall-FFT*
- *Symmetrical Components*



Renewable Testing

ACCORDING TO FGW-TR3, VDE-AR4105, BDEW ETC.

Renewable Power Plants like Wind, Photovoltaic (PV) and CHP (Combined Heat and Power Plant) 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 behaviour 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 mathematical operations). The DEWESoft® Power Analyzer 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 P, 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-f chart). The

data logging capability allows storing the raw data for analysing the switching processes or the behaviour at faults (Waveform analysis). The Math Library allows calculation of any statistical parameters (e.g. max. active power for 0.2s, 60s and 600s) 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.

ACTIVE & REACTIVE POWER	POWER QUALITY	BEHAVIOUR AT FAULTS
Active Power calculation ◣ Max. active power for 0.2s, 60s and 600s ◣ Input and output power (DC, AC)	**Flicker** ◣ Flicker coefficient (c) at different phase angles (30,50,70,85) according to IEC 61400-21 ◣ DC input power, reactive output power	**Dis- and Reconnection tests** ◣ Test of protection equipment – Check Settings and dis- and reconnection time for over- and undervoltage, over- and underfrequency
Operation at different set point settings for active and reactive power ◣ Calculation of deviation, min, max, averaged values for each setpoint ◣ Automatic check if within range ◣ Transient Behaviour ◣ Different charts (P, Q,S, U, I, f, cos phi)	**Switching Operations** ◣ Period values of P, Q, S, Urms, Irms (with overlap) ◣ Flicker step factor (kf) and voltage change factor (ku) at different phase angles (30,50,70,85) according to IEC 61400-21	**Behaviour at grid disturbances (Low Voltage Ride Through – LVRT)** ◣ Raw data analysis (waveform) at start and end of fault ◣ Analysis of fault length and specification of short-circuit current (peak value, ½ period value) at different times (t=0, t=150ms, etc.) ◣ Calculation of normalized active- reactive- and apparent power ◣ Half-wave RMS values for voltages & currents ◣ Positive-, negative and zero-sequence voltages ◣ Active-, reactive- and apparent power of positive-, negative- and zero-sequence-system
Power reduction at increasing frequency ◣ Check if power reduction within tolerance ◣ Calculation of gradients (%/Hz) and power difference (ΔP) ◣ Different charts (P, U, I, f)	**Harmonics, Interharmonics and THD** ◣ Calculation up to 50th order for U, I, P, Q, Z and phi ◣ Full and half-sidebands ◣ Harmonic smoothing filter	
Evaluation of reactive power provision ◣ Q_ind, Q_cap, Power Factor ◣ Voltage of positive sequence-system	**Higher Frequencies** ◣ Higher Frequencies from 2 to 9 kHz in 200Hz bands (possible up to 150 kHz)	

HIGHLIGHTS

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

TYPICAL CONFIGURATION

SIRIUS® R3

6x Voltage
6x Current
1x Low Voltage input for setpoint value

Wind Power Plant Testing

ACCORDING TO IEC61400

The IEC61400 defines all necessary tests for wind power plants which are necessary before they go into operation. This standard includes electrical measurements (Power Performance, Power Quality, Behaviour at faults) as well as mechanical measurements (Structural analysis, Sound level).

THE FOLLOWING TABLE SHOWS SOME PARTS OF THIS STANDARD:	
- IEC61400-11	Acoustic
- IEC61400-14	Sound Level
- IEC61400-12	Power Performance
- IEC61400-21	Power Quality (see page 41)
- IEC61400-23	Structural Testing

Due to the modular and flexible hardware concept of the DEWESoft® measurment instruments analysis for all of these parts with just one measurment instrument is possible.

Furthermore following analysis can additionaly be done:
- Power Quality accoridng to EN50160
- Transformer testing IEC 60076
- Inverter testing (z.B. dU/dt analysis)
- Generator testing

HIGHLIGHTS

- *Power Performance*
- *Power Quality*
- *Structural Testing and Sound Level*
- *Transformer-, Generator-, Inverteranalysis*

Power Performance analysis according to IEC61400-12
To determine the power performance of a wind power plant it's necessary to measure beside voltage and current measurement also parameters like wind speed, wind direction and temperature. The averaged values then get classified in BINS and out of this the power performance factor (CP) and the annual energy production (AEP) can be determined. Flexible Visualisations like Power Factor over Wind speed or a table with Bins, wind speed, power performance factor and power finalise the analysis capabilities of DEWESoft®.

Power Quality analysis according to IEC 61400-21 are already described on page 42. More information about analysis capabilites for Sound Level, Acoustics and Structual Analysis can be found in the brochrue "Dynamic Signal Analysis".

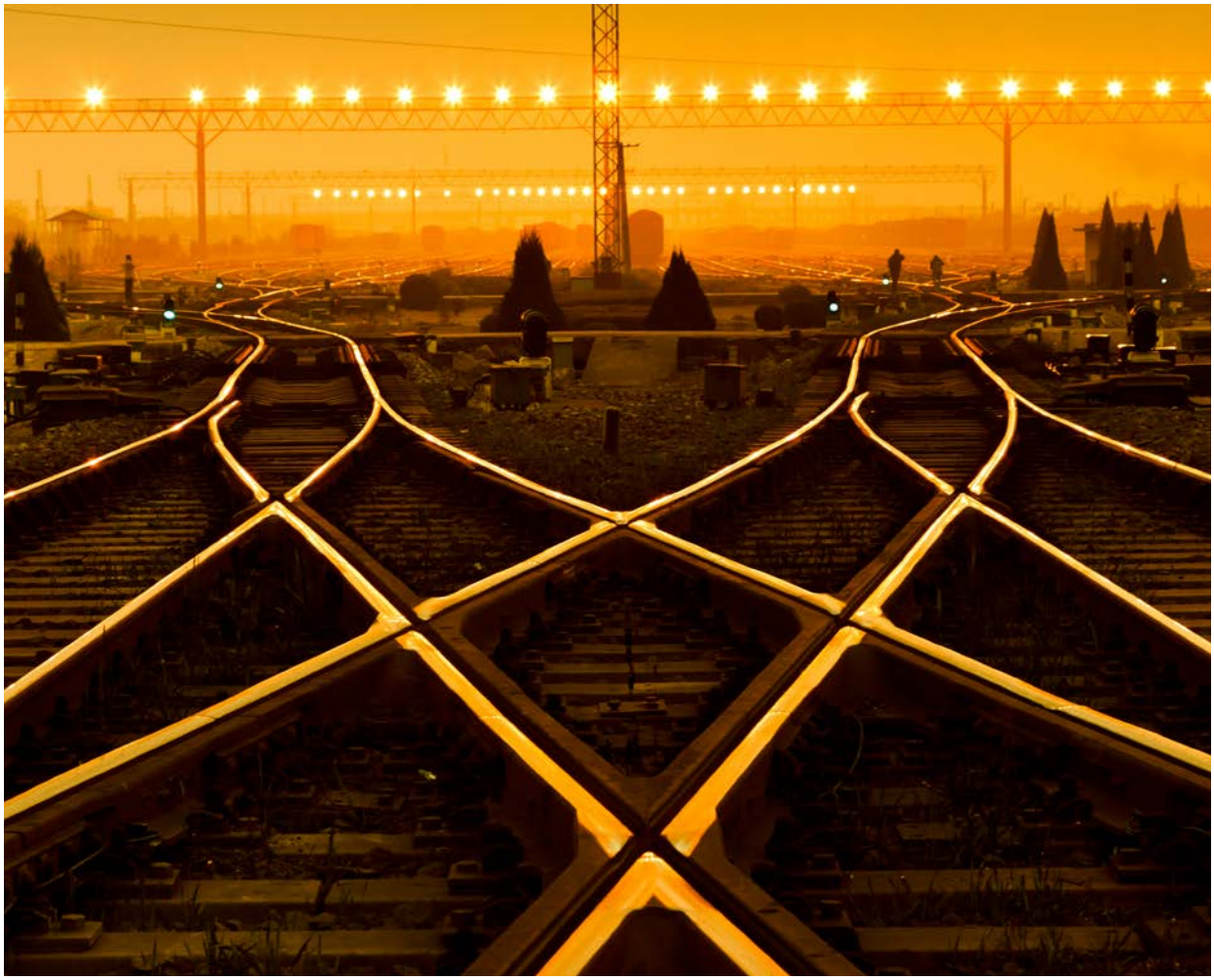
DEWESoft® measurement instruments are not only used for labrortory application, they are also used for monitoring of wind power plants (Power Performance monitoring, Power Quality Monitoring, Fault recording, etc.)

TYPICAL CONFIGURATION

SIRIUS® R3

3x Voltage
3x Current
Additional:
Wind-direction,
Windspeed,
Temperature, Pressure, etc.

Railway



PANTOGRAPH & CONDUCTOR RAIL TESTING

Train and railways are operated either with DC or AC power. They are operated at different voltage levels (250V up to 66kV) and different line frequencies (16.7Hz, 25Hz, 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).

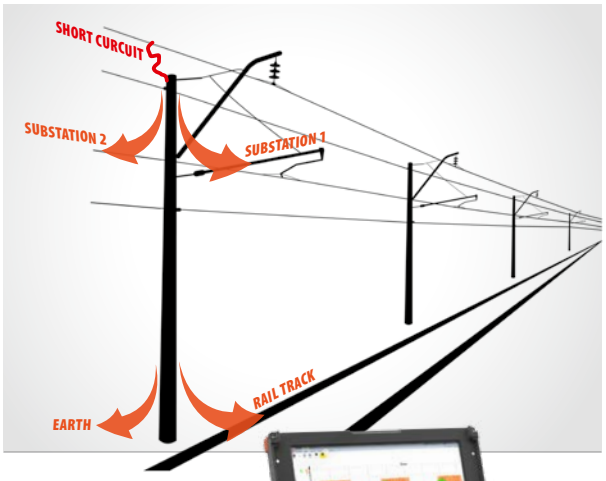
Voltage	Frequency	Example
12 kV	25 Hz / 1~	USA
15 kV	16,7 Hz / 1~	Germany, Austria, Switzerland, Sweden, Norway, ...
20 kV	50 Hz / 3~	Transrapid
25 kV	50 Hz / 1~	France, India, Russia, Turkey, UK
25 kV	60 Hz / 1~	USA, Korea
50 kV	50 Hz / 1~	South Africa
66 kV	50 Hz / 3~	Japan
250 V	DC	Mine Railway
500 V	DC	Mine Railway
600 V	DC	USA, Japan
750 V	DC	Germany, USA, Japan, UK
1200 V	DC	USA, Switzerland
1500 V	DC	USA, Spain, Japan, France, Germany , ...
3000 V	DC	Russia, Italy, Spain, Belgium

SHORT CIRCUIT ANALYSIS

Short-circuit analysis at railway power supply systems is a typical application for the Transient recording function of the DEWESoft® power Analyzer. At the expansion of short-circuits in railway power supply systems it is often assumed that the short-circuit current is spit 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 Analyzer 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 (analogue, digital, math, power, power quality etc.)*
- *Analysis at all line frequencies (16.7Hz, 50Hz, 60Hz, etc.)*



TYPICAL CONFIGURATION

SIRIUS® R2D

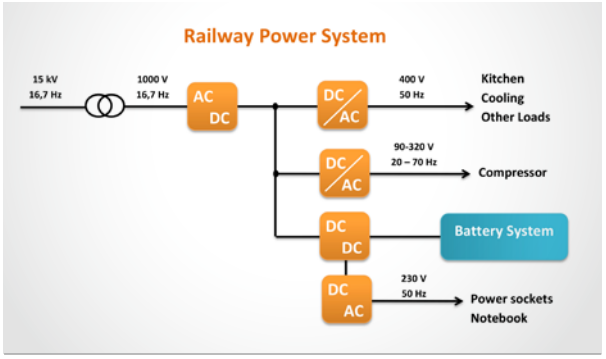
1x Voltage
7x Current

POWER SYSTEM TESTING

The electrical power for railway 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 (< 1000 V). 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

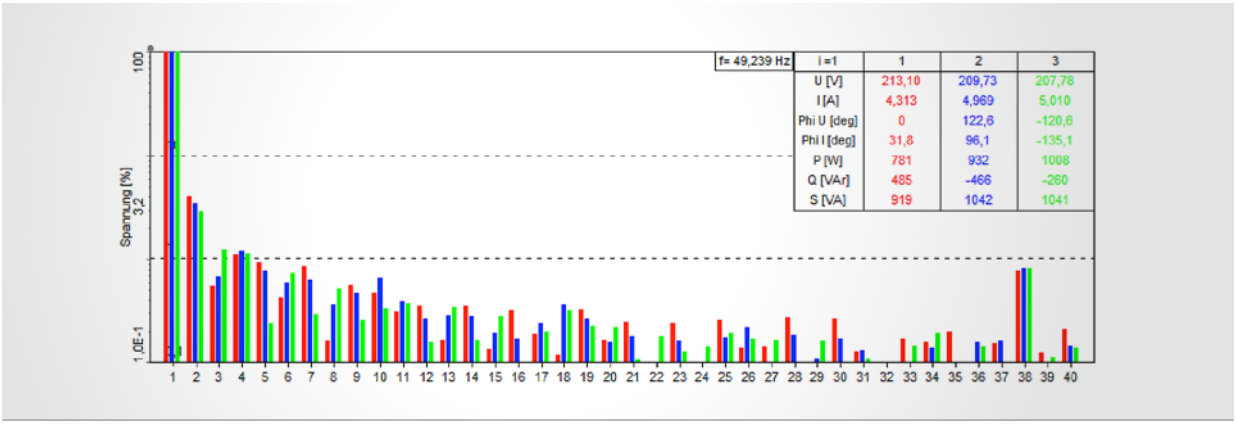
SIRIUS® R8D

1x 3-phase power
3x 1-phase power
3x DC-power

Aircraft

HARMONICS MEASUREMENT

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 Analyzer 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)



HIGHLIGHTS

- *Harmonics analysis up to 150kHz*
- *Power Quality analysis*

TYPICAL CONFIGURATION

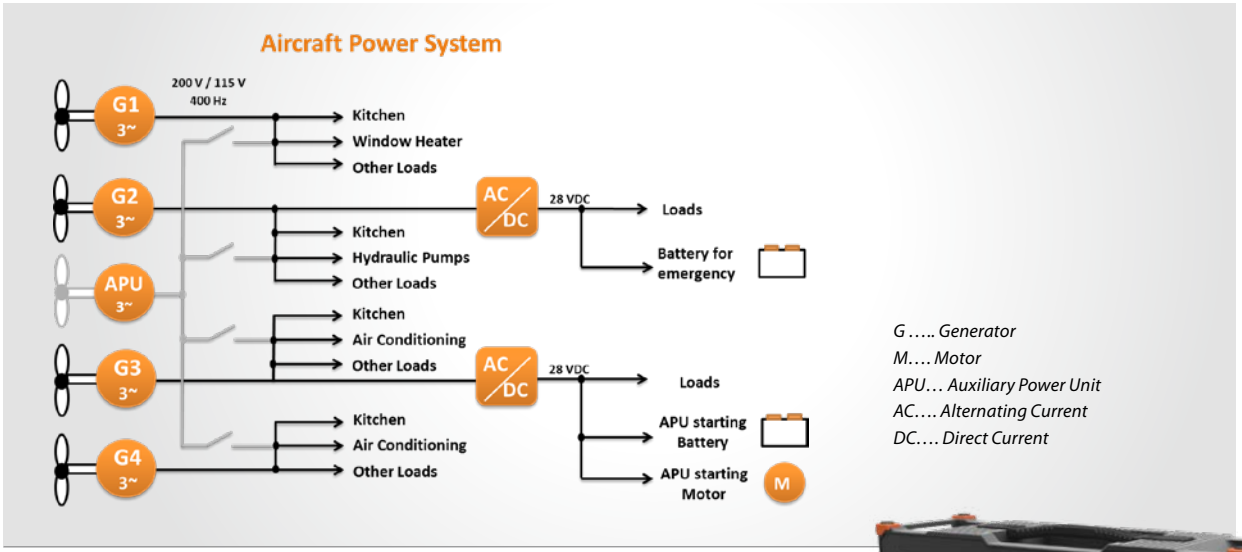
SIRIUS® POWER with integrated SBOX computer

3x Voltage
3x Current

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® can already show the analysis results during measurement.



G ….. Generator
M…. Motor
APU… Auxiliary Power Unit
AC…. Alternating Current
DC…. Direct Current

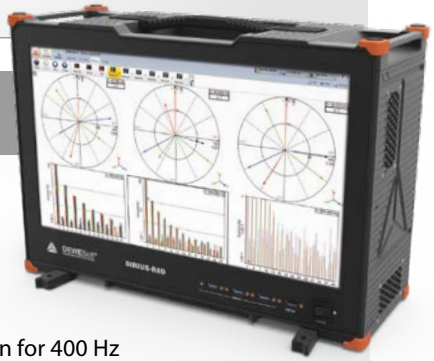
HIGHLIGHTS

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

TYPICAL CONFIGURATION

SIRIUS® R8D

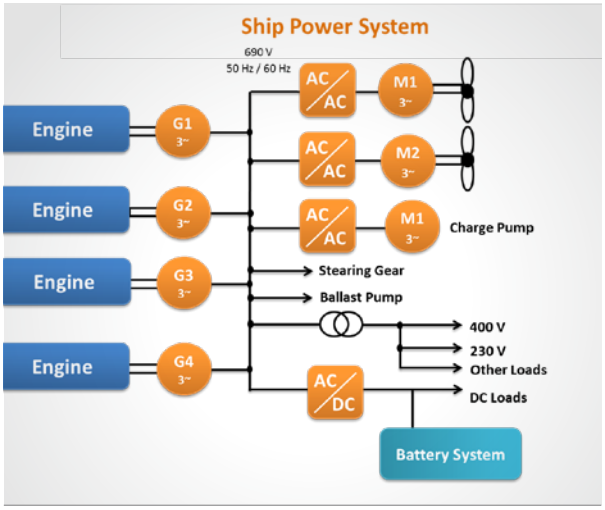
5x 3-phase power
7x 1-phase power
5x DC-power
Additional current transducer calibration for 400 Hz



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 Analyzer it is possible to fullfill a number of measurement applications with just one device. The DEWESoft® Power Analyzer combines all functionalities of an Oscilloscope, a Data logger, a FFT spectrum Analyzer , a Transient Recorder and a common Power Analyzer. 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, 1-12 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*

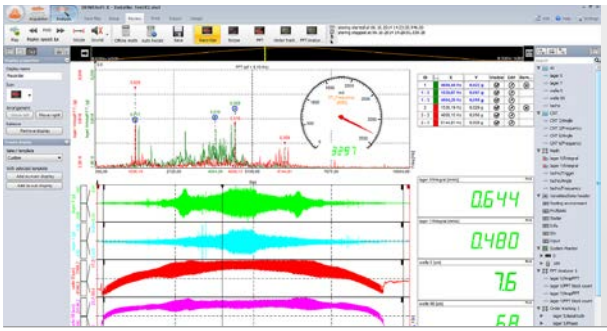
TYPICAL CONFIGURATION

SIRIUS® R8D

7x 3-phase power
4x 1-phase power
1x DC-power

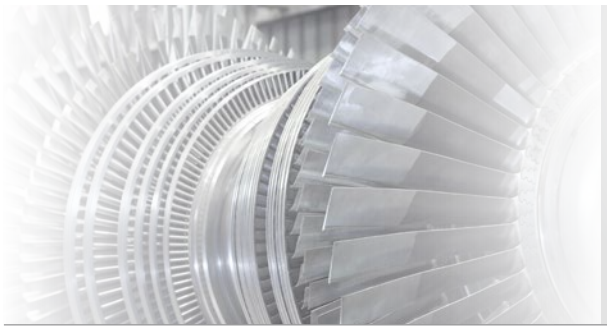
Additional Dynamic Signal Analysis Possibilities

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 Analyzer with multipurpose cursor functionalities*

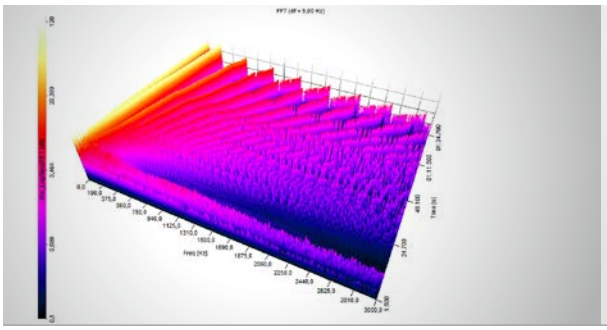


ROTATING MACHINERY

- *Ordertracking*
- *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*

Specifications

DEWESoft® POWER INSTRUMENTS

	DEWESoft® DS-R8D POWER	DEWESoft® DS-R3 POWER	DEWESoft® DS-R2DB POWER	DEWESoft® SIRIUS® POWER
OVERVIEW				
Max. isolated ChnNo.	64	24	16	8
Sample Rate/Res. - 1	1MS / 16 Bit	1MS / 16 Bit	1MS / 16 Bit	1MS / 16 Bit
Bandwidth	2MHz	2MHz	2MHz	2MHz
Sample Rate/Res. - 2	200 kS/s / 24 Bit	200 kS/s / 24 Bit	200 kS/s / 24 Bit	200 kS/s / 24 Bit
Bandwidth	75 kHz	75 kHz	75 kHz	75 kHz
Base accuracy	0.03%	0.03%	0.03%	0.03%
Max. Range	1600V DC	1600V DC	1600V DC	1600V DC
3 PHASE SYSTEMS	8	3	2	1
Tacho / Counter	16	4	4	2
CAN	up to 8	up to 3	up to 2	optional (SBOX up to 2)
Option Fanless	–	–	–	✓
Digital Inputs	192	72	48	24
Digital Outputs	64	24	16	8
Analogue Outputs	64 (optional)	–	16 (optional)	8 (optional)
Time Synchronisation	IRIG, GPS, NTP	IRIG, GPS, NTP	IRIG, GPS, NTP	IRIG, GPS, NTP

HIGH VOLTAGE INPUT	
ADC type	16 bit SAR with 100 kHz 5th order analog AAF filter or bypass (2 MHz)
Sampling rate	Simultaneous 1 MS/s
Ranges	±1600 V, ±800 V, ±400 V, ±200 V, ±100 V, ±50 V, ±20 V
Typ. SNR @ 100 kHz	85 dB
Input coupling	DC
Input impedance	10 MΩ in parallel 2pF
Overvoltage protection	In+ to In-: 4 kVpk-pk , Inx to GND: 2 kVpk-pk , CAT II 1000V, CATIII 600V

LOW VOLTAGE INPUT	
ADC type	16 bit SAR with 100 kHz 5th order analog AAF filter or bypass
Sampling rate	Simultaneous 1 MS/s
Ranges	±100V, ±50V, ±20V, ±10V, ±5V, ±2V, ±1V, ± 500mV, ±200mV, ±100mV and 50mV
Br ranges @ 10 Vexc	1000 mV/V, 100 mV/V, 10 mV/V
Input coupling	DC, AC 1 Hz (3 Hz, 10 Hz per SW)
Input impedance (100 V range)	10 (1) MΩ between IN+ or In- and GND
Bridge modes	Full bridge
TEDS	Standard + DSI® adapters, only on DSUB 9 version
Sensor Excitation	2 to 30 V bipolar / 0 to 24 V unipolar, sw programmable (16 bit DAC), max 0,2 A / 2 W
Overvoltage protection	Range < 10 V: 100V (200 V peak for 10msec); Range ≥ 10 V: 300 V cont.; 1000V with banana plug
Connector	BNC, DSUB 9, Banana, Screw Connector

** Fanless operation only for BNC or Banana version (without excitation)*

INPUT OPTIONS AND MODULES

	DEWESoft® DS-R8D POWER	DEWESoft® DS-R3 POWER	DEWESoft® DS-R2DB POWER	DEWESoft® SIRIUS® POWER
				
INPUT OPTIONS & MODULES				
Custom Configuration	every single channel			
Voltage	from +/-10mV up to +/-1600V			
IEPE/ICP sensors	DC, AC 1 Hz (3/10 Hz SW), IEPE 4/8 mA excitation, sensor detection			
Strain gauge (bridge)	Full-/half-/quarter bridge 3 or 4 wire, 120/350 ohm internal completion, custom shunt, high-precision voltage/current excitation			
Resistance	ranges: 100 … 100 000 ohm			
Temperature (PT100 to PT2000)	-200 … +850 °C; accuracy +/- 0,5°C			
Temperature (Thermocouple)	Type K,J,T,C with DSI® adapters (fit on DSUB9) Type K, J, T, R, S, N, E, C, U, B with KRYPTON modules, accuracy +/- 0,5°C			
Potentiometer	10…10 000 mV/V @ 1 V Excitation			
LVDT	differential LVDR or RVDT, inductive half-bridge LVDT, with DSI® adapter			
Charge	up to +/-100 000 pC; 150 dB dynamic; charge injection sensor test			
Current	external shunt / loop-powered shunt			
CAN BUS INTERFACE				
Specifications	CAN 2.0b High Speed, up to 1 Mbaud, optical isolation			
Supported protocols	J1939, OBDII, CAN sensors support, CAN output			
Nr of channels	2000+			
OUTPUT CHANNEL SPECIFICATIONS				
Sampling rate	simultaneous 200kS/sec			
Vertical resolution	24 bit sigma-delta DAC			
Output range	+/- 10V			
Functions	File replay, conditioned sensor signal output, FGEN (software option)			
TACHO/COUNTER SPECIFICATIONS				
	Counting, Waveform Timing, Encoder, Tacho, Geartooth sensor			
Timebase	102,4 MHz resolution			
Max input bandwidth	10 MHz			
Input filter	500 ns, 1µs, 2µs, 4µs, 5µs and 7.5µs selectable			
supported tacho inputs	optical tacho probe (1 pulse/rev), optical strip tape probe (with bl/wh tape, algorithm for determining number of pulses), 1-, 2-, 3- tracks encoder, geartooth with missing teeth (e.g. 60-2), CDM, CDM with zero, … configured in Counter Sensor Database			
INTER-SYSTEM SYNCHRONISATION				
Time Syncrhonisation	IRIG-B DC (50nsec), GPS (< 1µs), NTP (< 5ms)			
Time accuracy between devices	50 nsec, independent of used sampling rate			
Max. Sync-cable length	100 m (Clk/Trg), 200 m (IRIG)			
HIGH CHANNEL COUNT SYSTEMS				
Nr of channels	from 1 to 1000+			
Connections	1 Gb/s Ethernet network, synchronisation cable (IRIG)			
Data handling	live data transfer to Master Unit / local storage			
Operation modes	Master/Slave Measurement Unit, Master Client, View Client			
Software Addon	OPT-NET			
SYSTEM				
Dimensions (W x H x D) in mm	446 x 313 x 165	482,6 x 177 x 443 (4x height units in 19" brackets)	346 x 280 x 158	266 x 139 x 65
Dimensions (W x H x D) in inch	17,56 x 12,32 x 6,5	19 x 7 x 17,5 (4x height units in 19" brackets)	13,62 x 8,98 x 6,22	10,47 x 5,47 x 2,56
Weight	ca. 12 kg	16,7 kg	ca. 5 kg	1,5 kg
Power Supply	12-36 VDC	110 V / 230 V	9-36 VDC	6-36V
CPU	i7 Intel 8Core, 2.1GHz, 4 GB RAM (R8D, R2DB)			optional (SBOX)
Storage	128GB internal flash + 240 GB hot-swapable SSD (option 960 GB SSD)			
Interfaces	4x USB, VGA, GigE, WLAN, 2xSync	10x USB, VGA, GigE, WLAN, 2xSync	2x USB, VGA, GigE, WLAN, 2xSync	2x Sync
Display	17" Full HD – Multitouch	optional	12" Full HD – Touch	optional
Ambient conditions operation	10 ° to 50° C (40° for fanless device), 95% relative humidity, not condensed @60°C			
EMC	EN 61326-1, EN 61000-3-2, EN61000-3-3			
Shock & Vibration	Sweep Sinus (EN60068-2-6:2008); Random (EN60721-3-2:1997 – Class 2M2); Shock (EN60068-2-27:2009)			
61000-4-30	Class A	Class A	Class A	Class A

SOFTWARE FUNCTIONALITY

Functionality	DEWESoft® Power Analyzer
Power Analysis	✓
Power Quality Analysis	✓
Database Storing	✓
Post Processing	✓
Math Library	✓
Data logging - Raw data storing	✓ (data Storing in Full Sampling rate of 1 MS/s per channel)
Scope	✓ (up to 8 graphs in one diagram, Zoom In- and Out)
Vector Scope	✓ (1-, 2-, 3-phase systems)
FFT	✓ (up to ½ of Sampling Rate)
Harmonic FFT	✓ (up to ¼ of Sampling Rate)
Transient Recording	✓ (up to 1 MS/s)
Triggering Channels	Analog, Digital, Counter, Math, Power, etc.
Triggering options	Simple edge (rising, falling), Window (two-levels: entering, leaving), Pulsewidth (longer or shorter than duration), Window and Pulsewidth, Slope Trigger (rising or falling slope with steepness)

POWER ANALYSIS

Functionality	DEWESoft® Power Analyzer
Power Analysis for DC and AC	✓
Power Analysis	P, Q, S, PF, cos phi, D (Distortion), DH (Harmonic distortion), QH (reactive power of harmonics) (for each phase and total)
Fundamental Power	P_H1, Q_H1, S_H1, cos phi_H1, phi_H1 (for each phase and total)
Voltage and Current	RMS, RM, AVE (star and delta)
Energy Calculation	Total, positive and negative (e.g. Recuperation)
Efficiency	✓
Wiring Schematics	DC, 1-phase, 2-phase, 3-phase delta, 3-phase star, 3-phase V, 3-phase Aron, 6-phase (R2DB, R8D), 7-phase (R2DB, R8D, 12-phase (R8D))
Star-Delta Calculation	✓ (waveform and RMS values)
Frequencies	16.7 Hz, 25 Hz, 50 Hz, 60 Hz, 400 Hz, 800 Hz, Variable from 0.5 Hz up to 1.5 kHz
Frequency Source	Voltage, current, external
Period Values	U, I, P, Q, S, symmetrical components for ½, 1, 2 or 4 periods and selectable Overlap up to 99%
Number of Cycles for Power Calculation	5 - 12
Power Averaging	Selectable - starting from 1ms , Multiple Averaging (e.g. 20 ms, 60 s, 600 s) possible

POWER QUALITY

Functionality	DEWESoft® Power Analyzer
Harmonics (according to IEC61000-4-7)	up to 150 kHz for voltage, current, active-, reactive power, phase angle and impedance
Variable Sidebands and Half Sidebands (according to IEC61000-4-7)	✓
Harmonic Smoothing Filter (according to IEC61000-4-7)	✓
Interharmonics (according to IEC61000-4-7)	✓
Total Harmonic Distortion (THD) (according to IEC61000-4-7)	Voltage and current (Total, odd and even) - selectable up to 150 kHz
Total Interharmonic Distortion (TIHD) and K-factor (according to IEC61000-4-7)	Voltage and current (Total, odd and even) - selectable up to 150 kHz
Higher Frequencies (according to IEC61000-4-7)	up to 150 kHz (grouping in 200Hz bands)
Flicker (according to IEC61000-4-15)	selectable PST and PLT
Flicker Emission (according to IEC61400-21)	✓
Rapid Voltage Changes (according to IEC61000-4-15)	selectable steady state and hysteresis
Symmetrical Components (according to IEC61000-4-30)	Zero-, positive- & negative system for voltage and current (absolute or relative to fundamental)
Additional Symmetrical Components (according to IEC61400-21)	Active and reactive parts for zero-, positive- & negative system

Accessories

TRANSDUCER SPECIFICATIONS

	IT 60-S	IT 200-S	IT 400-S	IT 700-S	IT 1000-S
					
Primary Current Range DC, RMS Sinus	60 A	200 A	400 A	700 A	1000 A
Overload Ability Short Time (100 ms)	300 Apk	1000 Apk	2000 Apk	3500 Apk	4000 Apk
Max. burden resistor (100 % of Ip)	10 ohm	10 ohm	2.5 ohm	2.5 ohm	2.5 ohm
di/dt (accurately followed)	> 25 A/µs	> 100 A/µs	> 100 A/µs	> 100 A/µs	> 100 A/µs
Temperature influence	< 2.5 ppm/K	< 2 ppm/K	< 1 ppm/K	< 1 ppm/K	< 1 ppm/K
Output Ratio	100 mA at 60 A	200 mA at 200 A	200 mA at 400 A	400 mA at 700 A	1 A at 1000 A
Bandwidth (0.5 % of Ip)	DC ... 800 kHz	DC ... 500 kHz	DC ... 500 kHz	DC ... 250 kHz	DC ... 500 kHz
Linearity	< 0.002 %	< 0.001 %	< 0.001 %	< 0.001 %	< 0.001 %
Offset	< 0.025 %	< 0.008 %	< 0.004 %	< 0.005 %	< 0.005 %
Frequency Influence	0.04 %/kHz	0.06 %/kHz	0.06 %/kHz	0.12 %/kHz	0.06 %/kHz
Angular Accuracy	< 0.025° + 0.06°/kHz	< 0.025° + 0.05°/kHz	< 0.025° + 0.09°/kHz	< 0.025° + 0.18°/kHz	< 0.025° + 0.09°/kHz
Rated isolation voltage rms, single isolation CAT III, polution deg. 2 IEC 61010-1 standards EN 50178 standards	 2000 V 1000 V	 2000 V 1000 V	 2000 V 1000 V	 1600 V 1000 V	 300 V 300 V
Test voltage 50/60 Hz, 1 min	5.4 kV	5.4 kV	5.4 kV	4.6 kV	3.1 kV
Inner diameter	26 mm	26 mm	26 mm	30 mm	30 mm
DEWESoft® Shunt	5 ohm	5 ohm	2 ohm	2 ohm	1 ohm

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

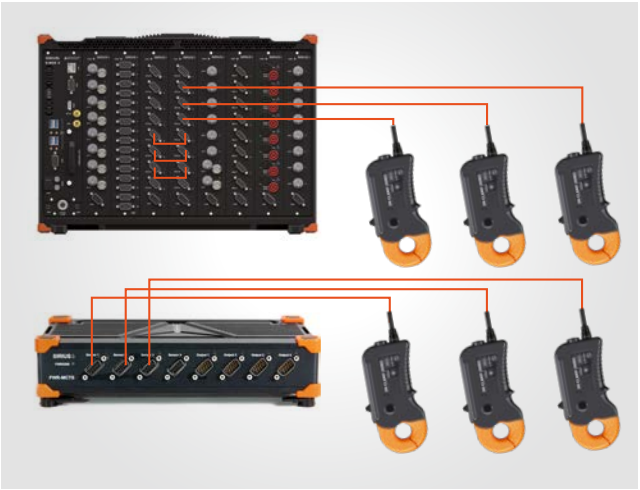
SIRIUSi-PWR-MCTS2 / SIRIUSir-PWR-MCTS2	
Power supply	9-36V DC
Max power consumption	85 W
Physical dimensions	265 x 140 x 65 [mm]
Operating temperature	-20 to 50°C
Storage temperature	-40 to 85°C
Humidity (@60°C)	95% RH non-condensing
Output	4x Isolated Power supply (1500V DC, 60sec)
Output voltage	+/-15V DC
Maximum output per channel	20 W
Short circuit protection	indefinite (automatic recovery)
Over load protection	150 % of Iout max. typ

This power supply is required for all zero-flux transducers: IT60-S, IT200-S, IT400-S, IT700-S, IT1000-S, and for the current clamps DS-CLAMP-200DC und DS-CLAMP-500DC.

CURRENT CLAMPS AC/DC

	DS-CLAMP-200DC	DS-CLAMP-500DC	DS-CLAMP-500DCS	DS-CLAMP-150DC	DS-CLAMP-1800DC
					
Type	Flux Gate sensor	Flux Gate sensor	Flux Gate sensor	Hall sensor	Hall sensor
Range	nominal 200 A rms / max. 400 A rms	500 A rms or DC	500 A rms or DC	150 A rms / 300 A peak	1800 Apk
Bandwidth	DC to 500 kHz	DC to 100 kHz	DC to 200 kHz	DC to 100 kHz	DC to 20 kHz
Accuracy	0.3 % of reading	0.3 % of reading	0.3 % of reading	1 % + 2 mA	2.5 % +/- 0.5A
Phase	≤ 0.1 ° (up to 100 Hz)	≤ 0.1 ° (up to 100 Hz)	≤ 0.1 ° (up to 100 Hz)	-	-
TEDS	Fully supported	Fully supported	Fully supported	Fully supported	Fully supported
Sensitivity	10 mV/A	4 mV/A	4 mV/A	20 mV/A	1 mV/A
Resolution	-	-	-	±1mA	±1mA
Overload Capability	500A (1min)	1000 A DC	-	500A DC (1min)	2000A DC (1min)
Dimensions (Clamp opening)	153mm x 67mm x 25mm (Ø 20 mm)	238mm × 116mm × 35 mm (Ø 50 mm)	153mm x 67mm x 25mm (Ø 20 mm)	205 mm x 60 mm x 15 mm ((Ø 32 mm)	205 mm x 60 mm x 15 mm (Ø 32 mm)

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



SIRIUSi-PWR-MCTS2 / SIRIUSir-PWR-MCTS2	
Power supply	9-36V DC
Max power consumption	85 W
Physical dimensions	265 x 140 x 65 [mm]
Operating temperature	-20 to 50°C
Storage temperature	-40 to 85°C
Humidity (@60°C)	95% RH non-condensing
Output	4x Isolated Power supply (1500V DC, 60sec)
Output voltage	+/-15V DC
Maximum output per channel	20 W
Short circuit protection	indefinite (automatic recovery)
Over load protection	150 % of Iout max. typ

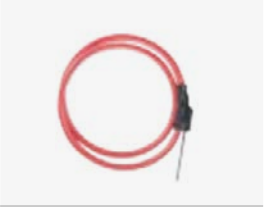
This power supply is required for all zero-flux transducers: IT60-S, IT200-S, IT400-S, IT700-S, IT1000-S, and for the current clamps DS-CLAMP-200DC und DS-CLAMP-500DC.

CURRENT CLAMPS AC

	DS-CLAMP-5AC	DS-CLAMP-15AC	DS-CLAMP-200AC	DS-CLAMP-1000AC
				
Type	Iron-Core	Iron-Core	Iron-Core	Iron-Core
Range	5 A	15 A	200 A	1000 A
Bandwidth	5 kHz	10 kHz	10 kHz	10 kHz
Accuracy	1 - 12 A: ± 0,5 % of readng 0.5 - 1 A: ± 1 % of reading 5 mA - 0,5 A: ± 2 % of reading	1% for currents of 1 - 15 A 2.5% for currents < 1 A	1% for currents of 100 - 240 A 2,5% for currents of 10 - 100 A 3,5% for currents of 0,5 - 10 A	0,3% for currents of 100A - 1200 A 0,5% for currents of 10A - 100 A 2 % for currents < 1A
Phase	1 - 12 A: ± 1 ° 0.5 - 1 A: ± 1 ° 5 mA - 0.5 A: ± 2 °	≤ 3° for currents of 1 - 15 A ≤ 5° for currents < 1 A	≤ 2,5° for currents of 100 - 240 A ≤ 5° for currents of 10 - 100 A not specified for currents of 0,5 - 10 A	0,7° for currents of 100A - 1200 A 1° for currents of 10A - 100 A not specified for currents of < 1A
TEDS	Fully Supported	Fully Supported	Fully Supported	Fully Supported
Sensitivity	100 mV/A	100 mV/A	10 mV/A	1 mV/A
Resolution	-	0.01 A	0.5 A	0.001 A
Overload Capability	-	Crest Factor of 3	Crest Factor of 3	1200 A for 40 minutes
Dimensions (Clamp opening)	102 x 34 x 24 mm (Ø 15mm)	135 x 51 x 30 mm (Ø 22mm)	135 x 51 x 30 mm (Ø 22mm)	216 x 111 x 45 mm (Ø 53mm)

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

ROGOWSKY COILS AC

	DS-FLEX-3000-35	DS-FLEX-3000-35-HS	DS-FLEX-3000-80	DS-FLEX-30000-120
				
Type	Rogowski coil	Rogowski coil	Rogowski coil	Rogowski coil
Range	3 A, 30 A, 300 A, 3000 A	3000 A	3 A, 30 A, 300 A, 3000 A	30 A, 300 A, 3000 A, 30000 A
Bandwidth	10 Hz to 20 kHz	1 MHz	10 Hz to 20 kHz	10 Hz to 20 kHz
Accuracy	1.5 %	1 %	1.5 %	1.5 %
Coil Length	350 mm (Ø 100 mm)	350 mm (Ø 100 mm)	800 mm (Ø 250 mm)	1200 mm (Ø 380 mm)
TEDS	not supported	supported	not supported	not supported

SHUNTS AND AC/DC TRANSDUCER

DSIi-10A / 20A

Type	Isolated Current Transducer
Range	10 A / 20 A (overload capability 80 A for 1 sec)
Accuracy	0,5%
Bandwidth	100 kHz
Safety Voltage	600V CAT III
TEDS	Fully Supported

DS-SHUNT-05

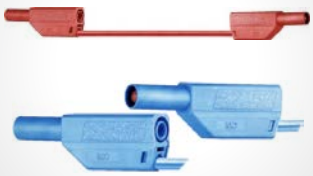
Type	Shunt
Range	5 A
Accuracy	0,1%
Resistance	0,05 Ohm
Safety Voltage	600V CAT III

ACCESSORIES

ALIGATOR CLIP

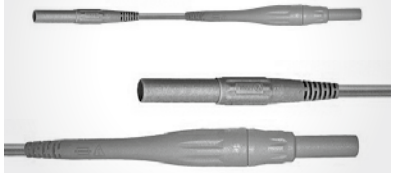
Current	max. 32 A
Voltage	CAT III / 1000 V
Colours	black, red, blue, yellow-green
Plugs	Ø 4 mm
Dimensions	92 x 38 mm

SAFETY TEST LEAD



Current	max. 32 A
Voltage	CAT II / 1000 V, CAT III / 600 V
Cross Section	2,5 mm²
Colours	black, red, blue, yellow-green
Plugs	Ø 4 mm
Length	0,25 m / 2 m / 5 m

SAFETY TEST LEAD FUSED



Current	max. 8 A
Voltage	CAT IV 1000 V
Cross Section	1 mm²
Colours	black, red
Plugs	Ø 4 mm
Length	2 m

STAR-POINT ADAPTER

Input	3 x Phase Voltage
Insulation	CAT III – 1000 V
Connector	Banana Plugs Ø 4 mm
High Frequency Range	

ACCESSORIES

BATTERY PACKS FOR MOBILE SOLUTIONS

BP2*i*

- *For SBOX 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*

BP4*i*

- *For SBOX and up to 8 SIRIUS® slices*
- *Supports 4 Li-Ion batteries each 96 Wh (total capacity: 384Wh)*
- *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*

USB-EXTENDER1

- *Well-tested solution for USB extension*
- *Extends USB up to 100 m (328 ft.) over UTP cable*
- *Hub 4 x USB (supports USB 2.0 and USB 1.1)*
- *Transmits signals up to 480 Mbps*
- *Uses inexpensive CATx cable you may already have installed in your building*
- *True plug and play – no drivers needed*

CAN INSTRUMENTS

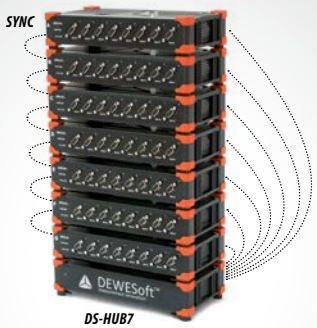
- *2, 4 or 8 high speed CAN interfaces (isolated)*
- *Sync with all DEWESoft® instruments*
- *5V / 500 mA sensor supply on each connector*

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

TEMPERATURE MEASUREMENT KRYPTON

- *Thermocouple types: K, J, T, R, S, N, E, C, U, B up to 100 Hz per channel*
- *Low Voltage ± 100 V up to 10 kHz per channel (BNC plug)*
- *24 bit ADC sigma delta*
- *1000V isolation*
- *Accuracy 0,02 %*

DS CAMS

- *Up to 600 fps @ VGA*
- *Full HD resolution (1920x1080)*
- *Power-over Ethernet*
- *IP67 available*
- *Real-time onboard JPEG compression*

TRANSPORT CASE

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

ACCESSORIES

DS-IRIG-ACDC

- *Converts IRIG AC signal to IRIG DC*
- *Useful for clocking SIRIUS®, DEWE-43 and DS-NET*
- *Can act as a converter from 4 pin Lemo to 2 pin Lemo (HW sync between SIRIUS® and DS NET)*
- *Can act like a converter from BNC IRIG DC to 4 and 2 pin Lemo for sync*

DS-VGPS-HSC

- GPS based position, speed and displacement sensor with 100 Hz
- Free programmable analog and digital output for speed and distance,
- High accurate, free programmable GPS synchronised clock source to GPS,
- Including, GPS antenna, power supply cable to cigarette lighte

DS-GPS-CLOCK

IRIG or GPS synchronized clock source

- Input: GPS antenna or IRIG signal code A or B, AM or DC
- Output: TTL clock from 10 Hz to 10 MHz, PPS, DS-SYNC and IRIG-B DC
- USB interface to host system, power supply over USB
- GPS antenna

DS-IMU1

DS-IMU1 is a **100 Hz** GPS / MEMS based inertial measurement system for standard vehicle measurement applications.

DS-IMU2

DS-IMU2 is a **500Hz** GPS / MEMS based inertial measurement system for advanced applications which require high position accuracy, high update rate and static heading.

DS-REM-CTRL

Control box:

- Start
- Stop
- Pause
- Shut down

MOB-DISP-10

- *10" industrial grade display*
- *1024 x 600 resolution*
- *Rugged housing*
- *Multi-touch*
- *250 cd/m² brightness*
- *-20 .. 50° C operating range*

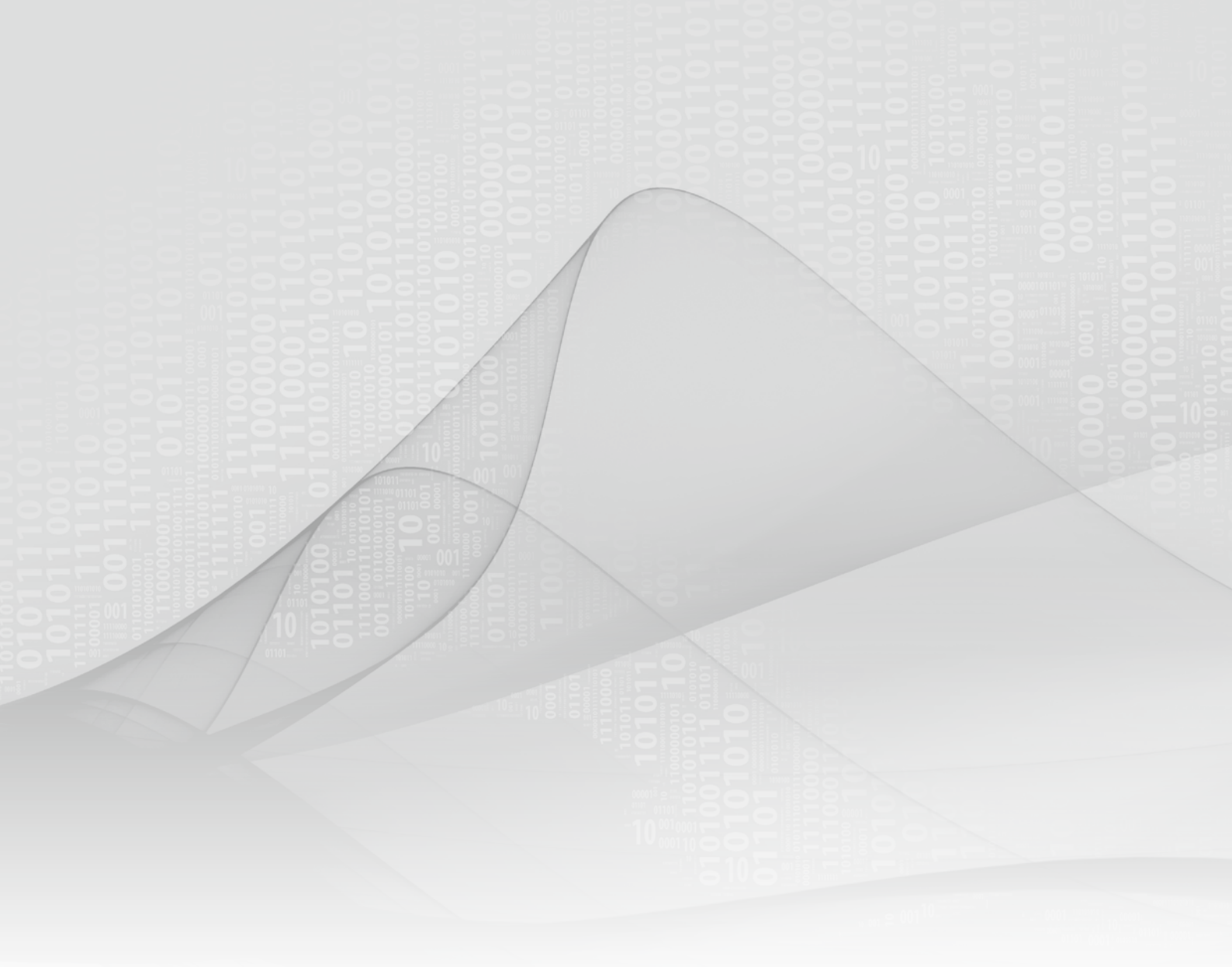
DS-DISP-12

- *12" industrial grade display*
- *1280 x 800 resolution*
- *Rugged housing*
- *Multi-touch*
- *700 cd/m² high brightness*
- *-20 .. 60° C operating range*

DS-MOUNT

Various mounting plates for DEWESoft® instruments. We also develop special mounting plates for larger projects, so please talk to your local sales agent for further information.

NOTES



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