



EMC TEST SYSTEMS FOR

AUTOMOTIVE

WITH THE 200, YOU GET EVERY WAVEFORM!

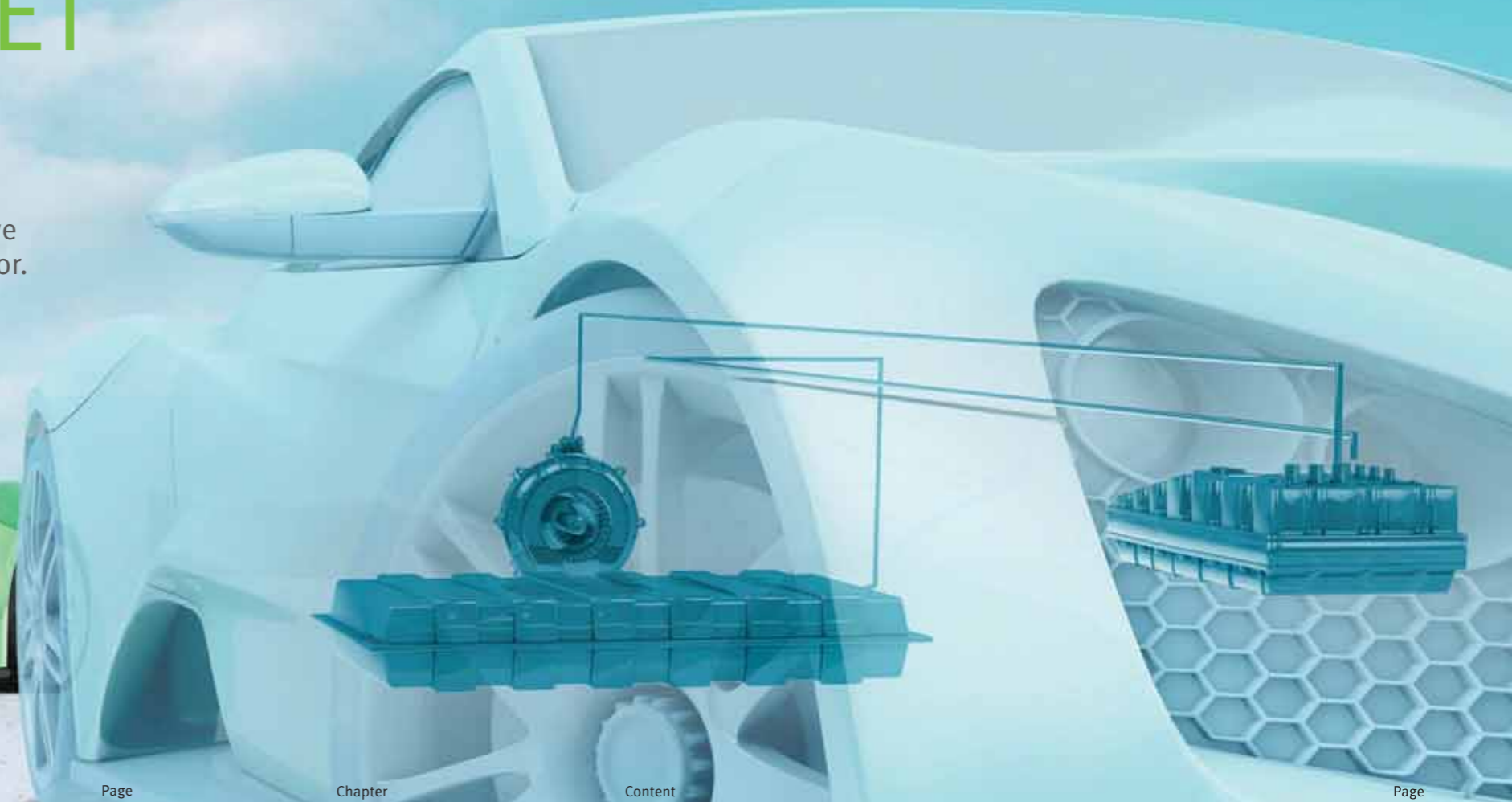
EM TEST test systems are the perfect solution for all automotive applications. Increasing standards in the areas of technology, safety, comfort, environmental sustainability, as well as the use of alternative drives, have rapidly transformed the automobile market, so innovation has become crucial. All of the testing equipment by EM TEST is designed with future technology in mind **because top performance requires expertise.**



Ready for the future

AND AT 500, THINGS GET REALLY INTERESTING!

With the innovative testing equipment by EM TEST for hybrids and e-cars, we are moving into an entirely new dimension of testing in the automotive sector.



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WHY EM TEST? OPTIMUM OPERATION

OUR EQUIPMENT HAS ALWAYS HAD TOUCH CONTROL. ONLY MORE INTUITIVE.



Round and simple.
Central operation
with a control dial.

Get started right away – access tests quickly using the predefined function. And with the uncomplicated control dial, it's easy to set the values.

Testing that's better than ever.

WHY EM TEST? THE LARGEST STANDARDS LIBRARY

THE BEST STANDARDS LIBRARY IN THE WORLD! SIMPLY SELECT ONE AND YOU'RE DONE..



Enough of the standards chaos:
All standards and their revisions
are defined and updated
in real-time by EM TEST.

All internationally known standards in the automotive sector are brought together in this unique control software: completely predefined tests make everything easy for you.

WHY EM TEST? MOBILITY FOR THE FUTURE

THE SMALLEST MOBILE TEST LABORATORY IN THE WORLD! THE AUTOWAVE.



THE AUTOWAVE. THREE DEVICES IN ONE.



1 WaveSimulator
The AutoWave generates simple anomalies in the on-board power supply.



2 WaveRecorder
While executing the on-board power supply anomalies, the AutoWave simultaneously gauges the reaction of the equipment under test.



3 WavePlayer
The AutoWave plays back the power supply anomalies recorded in the vehicle.

TRANSIENT IMMUNITY TESTING



UCS 200N & LD 200N: FOR ALL TRANSIENTS.

Virtually 100%* of today's transient testing in the automotive sector is conducted by only two EM TEST devices: the UCS 200N and the LD 200N.



* Standards that require specialized implementation (e.g. JASO, pulse E1, E2)

UCS 200N: VERSATILITY.



MODULE CN (COUPLING NETWORK)

- TYPE CN**
- > Central DUT output
 - > Overlap of all test pulses on DUT supply line
 - > Available in versions up to 60 V, 200 A

MODULE EFT

- ISO 7637-2/-3**
- > Pulse 3a, 3b
 - > Test voltage up to 1,000 V



MODULE MPG

- ISO 7637-2/-3**
- > Pulse 1 (12 V/24 V)
 - > Pulse 2a (12 V/24 V)
 - > Nearly all international vehicle manufacturer specifications



MODULE SAE

- SAE J1455**
- > Mutual pulse
 - > Inductive pulse



MODULE JASO

- JASO D001, D007, D902A**
- > Pulse A2, B2, D2
 - > JASO defines the pulse-forming network and the components to be used



MODULE NISSAN

- NISSAN NDS**
- > Puls B2, C8, C50 and C300
 - > Nissan defines the pulse-forming network and the components to be used



MODULE FREESTYLE

- PULSE PARAMETERS**
- > Test voltage: up to 600 V
 - > Rise time: $t_r = 1 \mu\text{s}$ to $10 \mu\text{s}$
 - > Pulse duration: $t_d = 50 \mu\text{s}$ to $10,000 \mu\text{s}$
 - > Internal resistance: $R_i = 2 \Omega$ to 450Ω

em.flow OPERATIONAL CONCEPT

- > Extremely easy to operate
- > Parameters can be set even during the test
- > Quick start
- > Standard programs
- > User programs
- > Select directly from standard test levels
- > Statistical test options
- > Predefined tests

EASY TO CONNECT

- > IEEE, USB interfaces
- > DUT monitoring, Fail 1, Fail 2
- > External test generators
- > ACC capacitive coupling clamp, ISO 7637-3 (CCC)
- > BCI clamp, ISO 7637-3 (ICC)
- > External impedance
- > External trigger input



Warning lamp | Safety circuit

TEST PULSES CUSTOMIZED EXACTLY FOR YOUR NEEDS: FREESTYLE MODE



Automotive technology is increasingly multifaceted and complex. Model updates and replacement occur more quickly, resulting in interference phenomena that are not covered by existing test procedures and specifications. The freestyle mode allows users to program their own test pulses and to update and reconfigure the current capabilities quickly and easily. Programming knowledge is not necessary.

FREESTYLE BY HAND

Step 1

```

UCS 200N          Micro Pulses
                   Burst Pulses
                   Freestyle
Ultra Compact Simulator
For automotive

U 2.20a01          SWN : 031016
        
```

Step 2

```

Main Menu
F1: Pulse 1      F4: Freestyle
F2: Pulse 2      F5: External
F3: Pulse 3a / 3b F6: Standards
F7: Service
        
```

Step 3: Set the parameters

```

FREESTYLE
Us : 20 V - 600 V
tr : 1 µs - 10 µs
td : 50 µs - 10000 µs
Rs : ext, 2 Ohm - 450 Ohm

Us pulse tr td +/- Rs 1/2
100 free 1 5000 - 10
        
```

Step 4: Active test

```

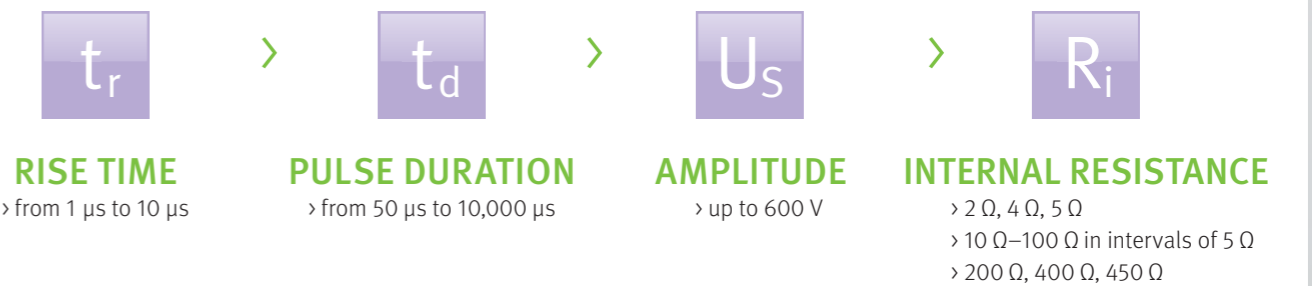
FREESTYLE
Us = 100V      pul = Free
tr = 1µs       td = 5000 µs
+/- = - 1µs    Rs = 10 Ohm
t1 = 1.0 s     t2 = 8.0 ms
tri = Auto     kpl = Supply
n = 500
STOP          ZOOM          COUNTER
                        8000155
        
```

Important features of self-programmable test routines are simple menu navigation that enables users to access the correct position quickly and a clearly arranged display that allows quick, easy programming.

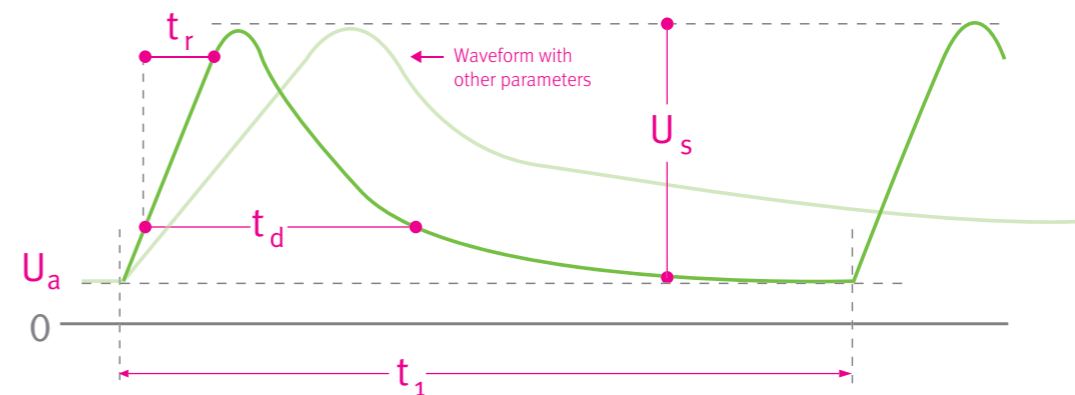
Of course, users can program the equipment itself manually or use the iso.control software.

PROGRAMMING IS EASY:

Step 1: Set the parameters



Step 2: Your test pulse is ready



LD 200N: THE POWER PACKAGE.



MODULE CN (COUPLING NETWORK)

TYPE CN
 > Overlap of all load dump pulses on the DUT supply line

MODULE ISO

Pulse 5a, 5b
 > 12 V on-board power supply
 > 24 V on-board power supply

MODULE SAE

SAE J1455
 > 12 V on-board power supply
 > 24 V on-board power supply

MODULE JASO

JASO D001
 > Pulse A1, B1, D1
 > defines the pulse-forming network and the components to be used

MODULE NISSAN

NISSAN NDS
 > Pulse A1, A2, B1
 > Nissan defines the pulse-forming network and the components to be used

MODULE CLIP

The built-in "Clipped Load Dump pulses" (CLD) module enables the generation of various test requirements, i.e. time parameters and clipping levels (U_s^*) can be set up between 15 V and 99.5 V as necessary.

MODULE FREESTYLE

GENERATE YOUR OWN TEST PULSE
 > Test voltage: up to 200 V
 > Rise time: $t_r = 1 \mu s$ to 10 ms
 > Pulse duration: $t_d = 10$ ms to 1,200 ms
 > Internal resistance: 0.5 Ω bis 38 Ω in intervals of 0.1 Ω

em.flow OPERATIONAL CONCEPT

- > Extremely easy to operate
- > Parameters can be set even during the test
- > Quick start
- > Standard programs
- > User programs
- > Select directly from standard test levels
- > Statistical test options
- > Predefined tests

EASY TO CONNECT

- > interfaces IEEE, USB
- > DUT monitoring, Fail 1, Fail 2
- > External trigger input
- > External impedance
- > External control of power supply switch
- > Pulse output for external coupling filters
- > Coupling filter with central DUT output



LD 200N: CREATE YOUR OWN TEST PULSES WITH FREESTYLE.



Automotive technology is increasingly multifaceted and complex. Model updates and replacement occur more quickly, resulting in interference phenomena that are not covered by existing test procedures and specifications. The freestyle module allows you to program your own test pulses and to update and reconfigure the current capabilities quickly and easily. Programming knowledge is not necessary.

FREESTYLE BY HAND

Step 1

```
LD 200N          Clip Modul
Load Dump Generator
U 2.10a01        SWN:
```

Step 2

```
Main Menu
F1: ISO          F4: Manufacturer
F2: JASO        F5: Freestyle
F3: SAE
F7: Service
```

Step 3: Set the parameters

```
Us : 20.0 V - 200.0 V
Clp : 15.0 V - 99.5 V
tr : 100 µs - 10000 µs
td : 10 ms - 1200 ms
Rs : ext. 0.5 Ohm - 38.0 Ohm
Us Clp pulse tr td Rs 1/2
100 34.0 free 100 400 10
```

Step 4: Active test

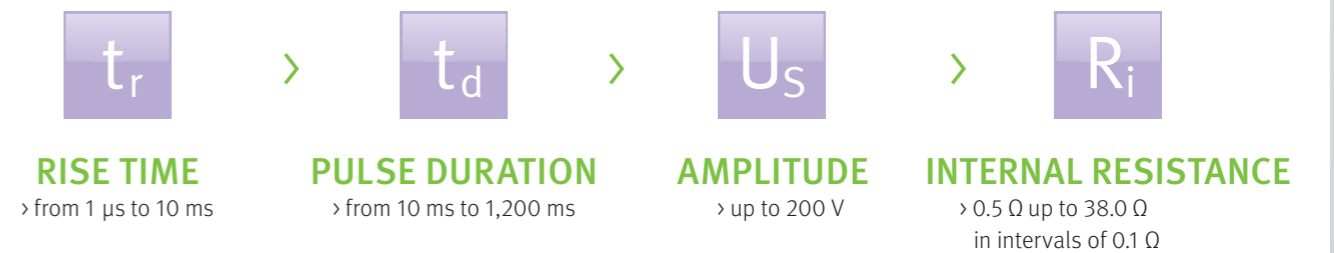
```
Us = 87.0 V      Clp = 34.0 V
Pul = free       tr = 100 µs
td = 400 ms     Rs = 10 Ohm
t1 = 45 s       tri = Auto
n = 10
STOP 200M      Pulse Counter
                17 s      0000155
```

Important features of self-programmable test routines are simple menu navigation that enables users to access the correct position quickly and a clearly arranged display that allows quick, easy programming.

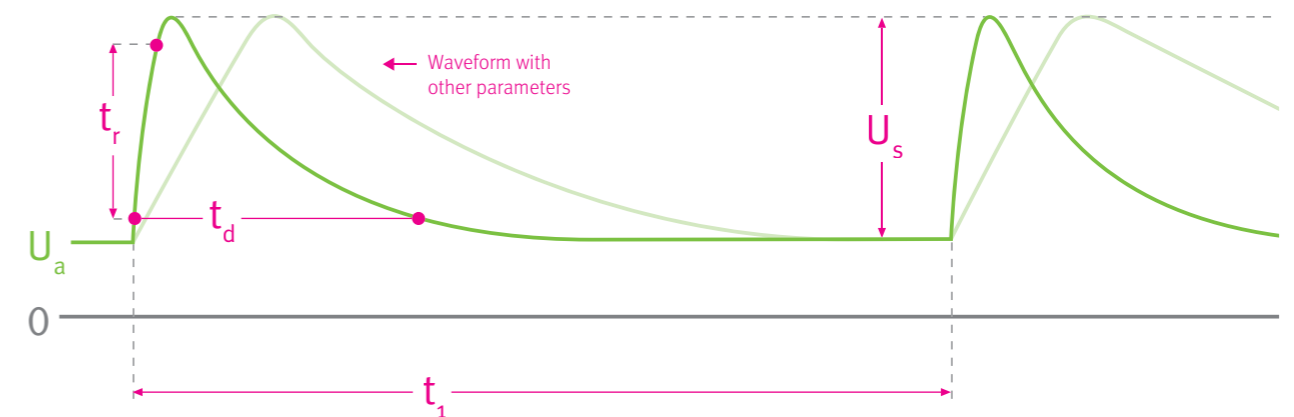
Of course, users can program manually or use the iso.control software.

PROGRAMMING IS EASY:

Step 1: Set the parameters



Step 2: Your test pulse is ready



UCS 200N SERIES

COMPACT SIMULATOR FOR AUTOMOTIVE TRANSIENTS



- > For pulses 1, 2a and 3a/3b
- > Test pulses per ISO, JASO, NISSAN, SAE and other manufacturers' specifications
- > Manual and remotely controlled operation
- > Freestyle, unrestricted pulse form generation

The ultra-compact simulator UCS 200N series for automotive transients combines the capabilities of EFT/burst simulators and micro-pulse simulators as well as the necessary coupling network – up to 200 A depending on model – in one device. The UCS 200N series meets all international standards and automobile manufacturer specifications.

A wide variety of pulse form parameters can be used. The built-in coupling network can be used and controlled with any device from the LD 200N, VDS 200N, and PFS 200N ranges.

SUPPORTED STANDARDS (EXCERPT)	
International:	ECE, ISO, JASO, SAE, ETS, GOST
Manufacturer*:	Audi, BMW, Mercedes, Porsche, Volkswagen, Ford, General Motors, Chrysler, FIAT, PSA, Renault, Volvo, Jaguar/Landrover, Hyundai/KIA, Honda, Mazda, Nissan, Toyota, Freightliner, Mack Trucks, MAN, Scania, Paccar, Ssangyoung, Tata Motors

PRODUCT RANGE	
UCS 200N50	Compact automotive generator 60 V/50 A
UCS 200N100	Compact automotive generator 60 V/100 A
UCS 200N150	Compact automotive generator 60 V/150 A
UCS 200N200	Compact automotive generator 60 V/200 A

*Supported standards, see page 86

GENERATED PULSES	
Pulse 3a	Pulse B2 (JASO)
Pulse 3b	Pulse D2 (JASO)
Pulse 3a (sweep)	Pulse B2 (Nissan)
Pulse 3b (sweep)	Pulse C8 (Nissan)
Pulse 1 (1/1000)	Pulse C50 (Nissan)
Pulse 1 (1/2000)	Pulse C300 (Nissan)
Pulse 1 (1/6000)	Pulse, inductive (SAE)
Pulse 1 (3/1000)	Pulse, mutual (SAE)
Pulse 1 (3/2000)	Pulse 1b (DC11224)
Pulse 2a (1/50)	Pulse D (Ford CI 220)
Pulse 6	Pulse 1 up to (PSA B217110C - Pos)
Pulse A2 (JASO)	Pulse 1b (MBN10284 - 24V)

TECHNICAL DATA (EXCERPT)	
Dimensions, weight	UCS 200N50 19" 3 HU approx. 25 kg UCS 200N100 19" 6 HU approx. 29 kg UCS 200N150 19" 6 HU approx. 35 kg UCS 200N200 19" 6 HU approx. 35 kg
Power supply	115/230 V +10/-15%
Fuses	4 AT (115 V)/2 AT (230 V)
Serial interface	USB
Parallel interface	IEEE 488, addresses 1 to 30

LD 200N SERIES

LOAD DUMP GENERATOR WITH "CLIP" FUNCTION



- > Load dump simulator per ISO 16750-2, ISO 7637, SAE J1113, SAE J1455, JASO, Nissan and many car manufacturers' specifications
- > Generates "clipped load dump" pulses
- > Freestyle, unrestricted pulse form generation
- > Pulse formation with RLC pulse-forming network

Load dump pulses have high pulse energy, which can be highly destructive to electrical or electronic equipment. The LD 200N series simulates these pulses with high energy in a range of up to 1.2 seconds. The LD 200N series generates load dump pulses per the respective requirements of the ISO 16750-2, ISO 7637, SAE J1113,

SAE J1455 and JASO standards and nearly all international manufacturers' specifications e.g. Ford, Chrysler, Renault, PSA, Nissan, etc. With the built-in clipping module, the LD 200N series also generates load dump pulses per international standards and manufacturer specifications.

SUPPORTED STANDARDS (EXCERPT)	
International:	ECE, ISO, JASO, SAE, ETS, GOST
Manufacturer*:	Audi, BMW, Mercedes, Porsche, Volkswagen, Ford, General Motors, Chrysler, FIAT, PSA, Renault, Volvo, Jaguar/Landrover, Hyundai/KIA, Honda, Mazda, Nissan, Toyota, Freightliner, Mack Trucks, MAN, Scania, Paccar, Ssangyoung, Tata Motors

PRODUCT RANGE	
LD 200N	60 V/30 A
LD 200N100	60 V/100 A with power supply switch
LD 200N200	60 V/200 A with power supply switch

*Supported standards, see page 86

GENERATED PULSES	
Pulse 5	Pulse 5 Ford - CS
Pulse 5 clipped	Pulse 5 Chrysler
Field decay	Pulse 5 Chrysler, clipped
Pulse SAE 12 V	Pulse 5 Chrysler ramp
Pulse SAE 24 V	Pulse Nissan A1
Pulse JASO A1	Pulse Nissan A2
Pulse JASO B1	Pulse Nissan B1 (Pos.)
Pulse JASO D1	Pulse Nissan B1 (Neg.)
Pulse 5 MBN 12 V	Pulse 5 Scania, bus
Pulse 5 MBN 24 V	Pulse 5 Scania, truck
Pulse 5 Ford - AB	Pulse 5a Allison
Pulse 5 Ford - AC	

TECHNICAL DATA (EXCERPT)	
Dimensions, weight	LD 200N 19" 6 HU (290 mm) approx. 25 kg LD 200N100 19" 9 HU (420 mm) approx. 39 kg LD 200N200 19" 9 HU (420 mm) approx. 42 kg
DUT supply	Max. 60 V/30 A ; 100 A ; 200 A
On-board power supply internal switch	100 A (LD 200N100) 200 A (LD 200N200)
Supply voltage	115/230 V +10/-15%
Fuses	2 x 4 AT (115 V)/2 x 2 AT (230 V)
+/- Output	Safety laboratory plug
Serial interface	USB
Parallel interface	IEEE 488, addresses 1 to 30
CN interface LD 200N	For controlling of the external coupling network from the UCS 200N series with integrated battery switch

MPG 200S21

TEST PULSE E1 AND E2 FOR JASO D 001-94



- > Tests for JASO D 001-94
- > Test pulse E1, E2
- > Integrated electronic battery switch
- > Coupling network for up to 60 V/50 A DC

The MPG 200S21 contains exactly the elements prescribed in the JASO standard for generating E1 and E2 pulses for 24 V systems per JASO D001-94. The built-in electronic battery switch interrupts the DC voltage supply.

The standalone test simulator with the 60 V/50 A DC coupling/decoupling network can be easily integrated into an existing test system. It can be operated manually or with software via the GPIB or USB interfaces.

DATASHEETS FOR ALL OF OUR EQUIPMENT CAN BE FOUND AT:


www.emtest.com




SUPPORTED STANDARDS

> JASO D001-94

GENERATED PULSES

 JASO pulse E1

 JASO pulse E2

PRODUCT RANGE

MPG 200S21 Pulse E1, E2

TECHNICAL DATA

Impulse voltage	20 V–500 V
Polarity	negative
Repetition rate	1.0 s–99.0 s
Pulse E1	
Capacitor voltage	V _c = -457 V
Capacitor C	1,000 µF
Rise time	< 1 µs (0%–100%)
Pulse duration tau (36.8%)	26 ms ± 20%
R2 resistance	27 Ω ± 10%
R3 resistance	300 Ω ± 10%

TECHNICAL DATA

Pulse E2	
Capacitor voltage	V _c = -320 V
Capacitor C	2,000 µF
Rise time	< 1 µs (0%–100%)
Pulse duration tau (36.8%)	26 ms ± 20%
R2 resistance	13 Ω ± 10%
R3 resistance	210 Ω ± 10%
Supply voltage	115 / 230 V +10 / -15% (optional 100 V)
Fuses	2 x 2 AT (115 V) / 2 x 1 AT (230 V)
Dimensions	19" 3 HU (394 mm x 484 mm x 154 mm)
Weight	13.0 kg

ISO.CONTROL: MAKES THE COMPLEX EASY

With iso.control everything is right there for you. It's never been so easy to create and document test runs.



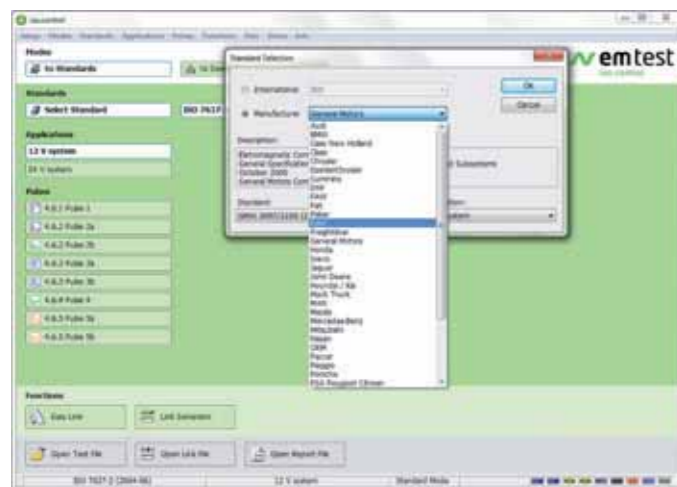


From the first standard selection to the completed test report, the iso.control software offers everything that you expect from user-friendly EMC test software, which means that it is compatible with EM TEST hardware as well. Brilliant.



“EVERY TEST STANDARD AT YOUR FINGERTIPS: PERFECT!”

“EASY TO INTEGRATE: EXTERNAL MEASURING DEVICES AND ADDITIONAL ACCESSORIES”



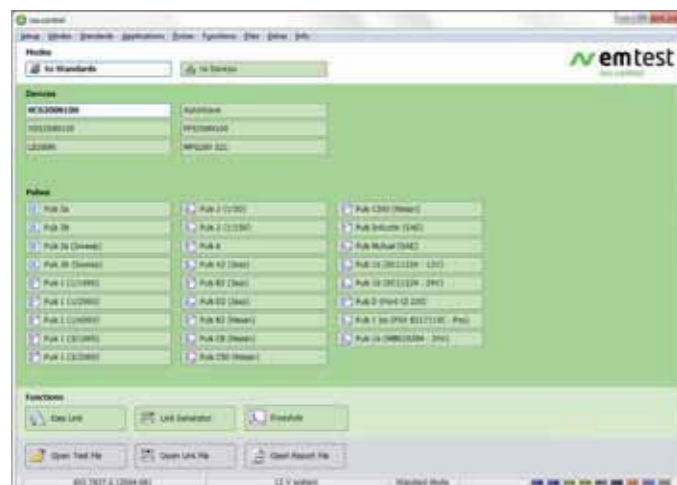
01 STANDARD SELECTION (STANDARDS LIBRARY)

A comprehensive library contains EVERYTHING:
National/International:
 Here are the ISO, DIN, ECE, EN, ETS (communication), JASO and SAE standards.
Manufacturer specifications:
 Selection is organized by European, American, Japanese and other Asian vehicle and commercial manufacturers.



03 ESSENTIAL ACCESSORIES

Today's DUTs (devices under test) are very complex. Their operation requires a wide variety of accessories and auxiliary devices. To ensure that test results are reproducible, all of the accessories and auxiliary devices used in the test set-up must be documented in the test report.
 The iso.control has a library just for that purpose!



02 TEST PULSE SELECTION

To create your own specification, you can switch from the standard library to the “Device mode” section, where you'll find all of the available test pulses for the selected device.
 Choose the ones you need, create your test routines and save them. Then you can always access these test routines with a single click.



04 MEASURING DEVICE INTEGRATION/SELECTION

An oscilloscope is often required, e.g. in a function test prior to testing or a pulse verification per ISO 7637-2 (annex D). EM TEST supplies a driver library for this purpose.
 If the necessary driver is not available, you can easily expand the library yourself in just a couple of minutes.

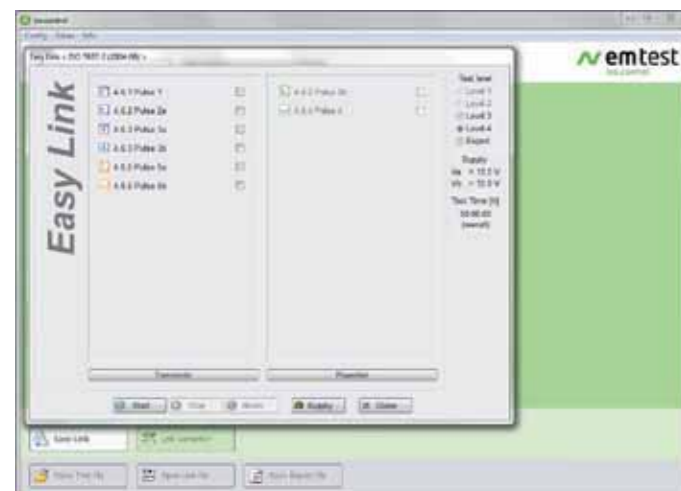


Automated test runs are completely preprogrammed with the Easy Link. Just click the desired tests and start them. Custom test routines can be created easily with the link generator.



“IN A CLASS BY ITSELF: COMPOSE FULLY AUTOMATIC TESTS”

“ABSOLUTE CONTROL.” TEST EXECUTION AND TEST RESULTS ARE ALWAYS IN VIEW.



05 EASY LINK FUNCTION

Fully automatic test routines can be created. With the EASY LINK function, it's quite easy connect test pulses and power supply anomalies from the library.



07 TEST EXECUTION

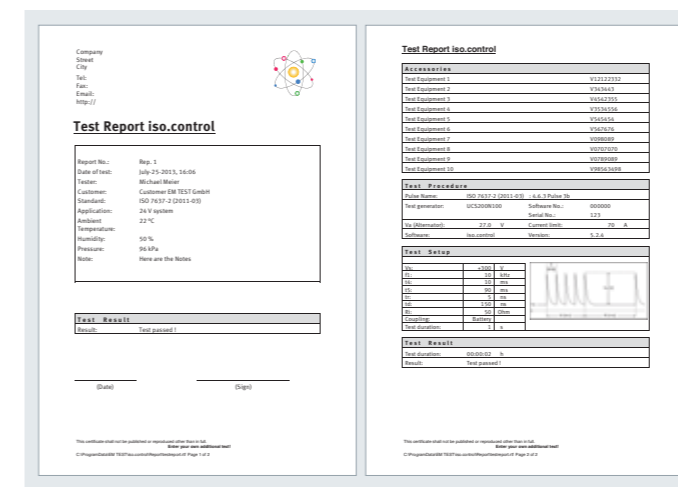
Test is started => Current test pulse and all test parameters are displayed. You can interrupt the test, move on to the next test or cancel the test at any time. Of course you can enter a comment for each step executed so that EVERYTHING is documented afterwards. When using an external measuring device for test monitoring, you define the steps manually first, then the measuring device executes them automatically.



06 TEST ROUTINES

Fully automatic test routines can be created with the link generator. In the link file, test files are compiled into a fully automatic test routine. The iso.control software takes charge of all of the measuring and test devices.

You can concentrate fully on your DUT while iso.control handles everything else.



08 TEST DOCUMENTATION

iso.control registers test interruptions, recognizes DUT operational conditions that have been set up previously (monitoring by an external measuring device), and adds the respective comments to the relevant parameters and test times. The pulse forms recorded by the oscilloscope can also be integrated into the test report.

Afterwards, the test reports can also be entered into any desired Windows program (Word, Excel, etc.), where you can add with the corporate logo (corporate identity), or additional text or information before saving them.

BATTERY SIMULATION



THE BLACK BOX FOR YOUR TEST DRIVES: THE AUTOWAVE

The first combined, multi-functional data recorder in the world for real-time recording, analysis, and simulation of voltage waveforms in on-board supply systems.

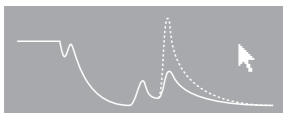
HOW THE AUTOWAVE WORKS ON THE ROAD:



01 RECORD
› Direct recording during the drive



02 SAVE
› The complete session is saved internally



03 EDIT
› Highly efficient software suite



04 PLAYBACK
› Simulates the power supply perfectly



“Three in one. Simply perfect!”

WAVESIMULATOR



Simulate exactly what you want

- › Generates voltage profiles and their waveforms per international standards and manufacturer's specifications
- › The signal generator calculate uses parameterized segments to the voltage form online, so memory is no longer limited.

WAVERECORDER



The black box for your test

The increasing complexity of the electronic systems used in vehicles for connectivity, vehicle safety and comfort, environmental sustainability and to control alternative drives must always function RELIABLY. For this reason, we developed the AutoWave, which can be used in both mobile and laboratory situations. The WaveRecorder measures and saves all possible variations in power supply and voltage characteristics. You can even program the AutoWave so that it only records the voltage for a specified time period before and after a transient. In this way, only the interference is measured.

WAVEPLAYER



Playback of voltage waveforms

The AutoWave plays back the measurements recorded in the vehicle via the VDS 200N voltage source in the laboratory, just as though you were actually on the road. The real power supply anomalies are replayed and eliminates interference from your DUT.

AUTOWAVE: SIMULATE + MEASURE + ANALYZE IN DETAIL

Today, intelligent systems in motor vehicles control many functions for driving safety, passenger protection, comfort, and functionality. The AutoWave ensures complete disturbance protection.

APPLICATIONS

- > The device can be used as a standalone device, installed in a vehicle to measure the power supply, or built into a laboratory system.

VOLTAGE SUPPLY

- > AC 90–250 V / 47 Hz–63 Hz
- > DC 12 V to 32 V from the vehicle battery
- > Internal battery for bridging voltage dips (optional)

CONTROL

- > EM TEST control: “autowave.control” or “iso.control”
- > Standalone test system with test routines saved in AutoWave
- > AutoWave control with customer specific software

VOLTAGE MEASUREMENTS

- > 2 measurement inputs: 5 V, 10 V, 20 V, 50 V, 100 V, unipolar or bipolar
- > Sampling 5 S/s to 500 kS/s
- internal memory: max. 1 GB
- > Sampling rate: 5 Hz, 10 Hz, 25 Hz, 50 Hz, 100 Hz, 200 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 2.5 kHz, 5 kHz, 10 kHz, 20 kHz, 25 kHz, 50 kHz, 100 kHz, 200 kHz, 250 kHz and 500 kHz (configurable)



DATA IMPORT

- > File size/memory: up to 1 GB
- > Formats: Excel, Matlab, CSV, Scope
- > Sample rate: 5 S/s to 500 kS/s

POINT WAVES

- > File size: up to 1 GB
- > Test file is compiled from multiple, individually editable point sequences

TRIGGER

- > 2 inputs and 2 outputs
- > All individually configurable

SEGMENT WAVES

- > DC, sinusoidal, ramp, rectangular, triangular, exponential, step, profile, saw tooth, damped sine, switch, sine sweep, sine ramp

PARAMETERS

- > Enter all parameters as defined in the standard: 10%–90% or 0%–100%
- Exponent: 10%–90% or tau
- > All parameters are iterable based on a selectable order.
- > More complex tests, e.g. Jaguar CI 265, can be programmed using the pseudo-random function

AUTOWAVE

MOBILE WAVE SIMULATOR AND RECORDER FOR POWER SUPPLY SIMULATION



- > Dual-processor technology, sample rate of 500 kS/s
- > 4-channel arbitrary generator
- > 2-channel transient recorder
- > Simultaneous generation and recording
- > Standards library
- > Pseudo-random function

Battery/power supply simulation is gaining traction in today's automotive testing field. Waveforms are increasingly complex. Some standard phenomena, such as starting the engine, are tested as before, but real-time signals are becoming increasingly important for testing entire vehicles or individual components under real conditions. Ordinary arbitrary generators often fail in this regard.

The AutoWave combines a 4-channel arbitrary generator with a 2-channel transient recorder in a compact and handy device. The AutoWave offers the perfect solution for generating and recording any voltage forms in the automotive sector, even right in the vehicle itself.

SUPPORTED STANDARDS (EXCERPT)

International: ECE, ISO, JASO, SAE, ETS, GOST
 Manufacturer*: Audi, BMW, Mercedes, Porsche, Volkswagen, Ford, General Motors, Chrysler, FIAT, PSA, Renault, Volvo, Jaguar/Landover, Hyundai/KIA, Honda, Mazda, Nissan, Toyota, Freightliner, Mack Trucks, MAN, Scania, Paccar, Ssangyoung, Tata Motors

*Supported standards, see page 86

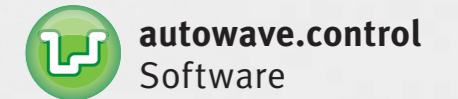
GENERATED PULSES

- | | | |
|----------------------|----------------|------------------|
| Pulse 2b | Voltage drop | Voltage profile |
| Pulse 4 | Ramp down/up | Reversed voltage |
| Pulse 4, sine 2 Hz | Ramp up/down | Jump high |
| Pulse 4, sine 4-5 Hz | Ramp down | Jump low |
| JASO | Ramp up | Triangle high |
| Cranking | Ramp down/high | Triangle low |
| Sine | Ramp low/up | Overstress |

TECHNICAL DATA (EXCERPT)

Output channel	2 channels, 2 additional channels can be added as an option (ExtBoard)
Output voltage	10 V, unipolar or bipolar
Resolution	16 bit
Frequency	DC–50 kHz
Temperature	0°C–40°C
Relative humidity	10%–90%, non-condensing
Power supply	AC: 90 V–250 V, 47 Hz–63 Hz, DC: 12 V–32 V
Fuses	1 A slow
Power output	40 W max.
Dimensions	100 mm x 380 mm x 390 mm
Weight	6 kg
Interfaces	GPIB Ethernet USB (for flash drive) Frame bus (internal system bus)
Display	Text-LCD 2-line, 40 characters
LEDs	Power on Active channels: 6 (2 inputs, 4 outputs) Trigger Status display for the hard disk
Operation	6 function keys
Trigger	2 inputs, 2 outputs
DUT monitors	2 inputs, configurable

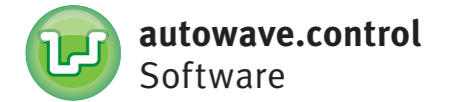
AUTOWAVE.CONTROL: EVERYTHING'S INCLUDED



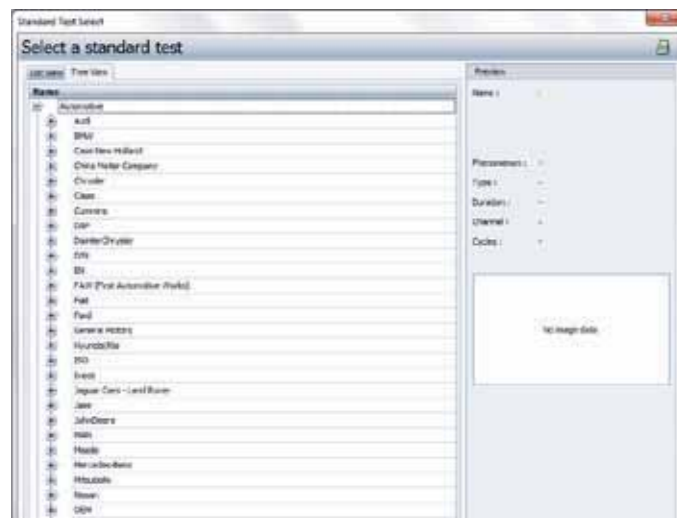
Simulate any power supply anomalies you choose and find out the reasons for even the slightest disturbances. With autowave.control, from a wide variety of predefined tests, it's easy to select the right one. **Try it for yourself!**



The complete listing of all known standards in the automotive industry is unique. No software offers more, especially when it comes to standards. Even the predefined tests have no equal. Everything is already set up for you. This makes testing fun.

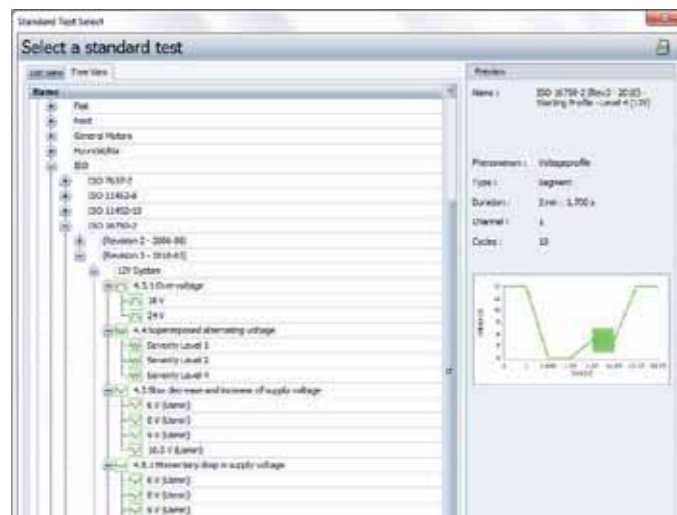


STANDARDS LIBRARY/PULSE SELECTION



01 FIND INTERNATIONAL AND MANUFACTURER STANDARDS

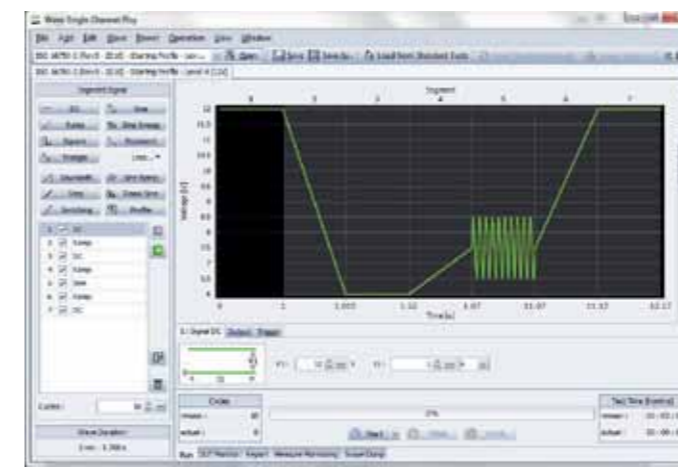
The most complete standard library for on-board supply tests!
The library includes alphabetically sorted national and international standards such as ISO, DIN, LV 124, EN, JASO, ETS, SAE and international manufacturer standards (even tests that are longer than 24 hours or that have pseudo-random parameter changes as per Jaguar CI 265 and Toyota tests with 4743 iterations according to TSC 7021 G).



02 STANDARD AND PULSE SELECTION

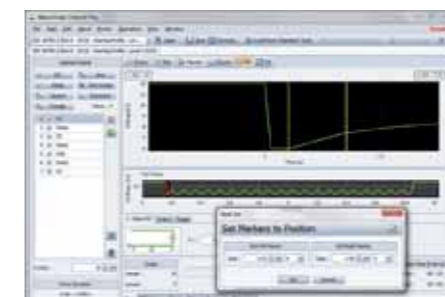
After the standard is selected, the release date and respective revisions as well as all possible tests according to the standard and the various test levels are displayed in a clear arrangement.

When you select a test pulse, at a glance you will see the requested normative test level, test parameters and test pulse characteristic in a graph.

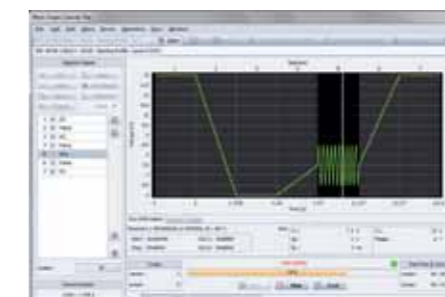


03 TEST WITH STANDARD FILES

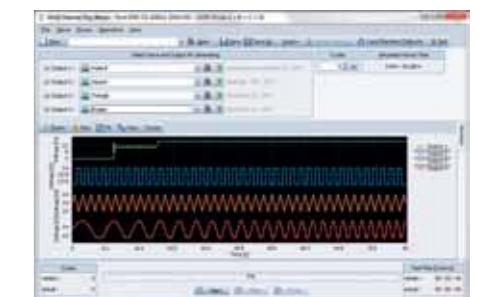
- 1 Wave editor for segment waveforms**
The selected test pulse is displayed with the requested normative test parameters and, in addition, all of the segments that „comprise“ the test pulse are shown. You can modify parameters instantly.
> Choose the segment, change the parameter!
- 2 Overview with the zoom function**
The overview function displays each individual segment as well as the entire wave form. A wide variety of zoom functions allow a section of the wave form to be displayed in the x- or y-axis or in accurate detail.
> Additional markers show the desired time period
> The pan function moves the visible field in any direction
- 3 Test execution time stamp**
Regardless of the test sequence currently running, autowave.control shows the time stamp in the display and you can immediately see which voltage form is currently affecting the DUT.



2



3

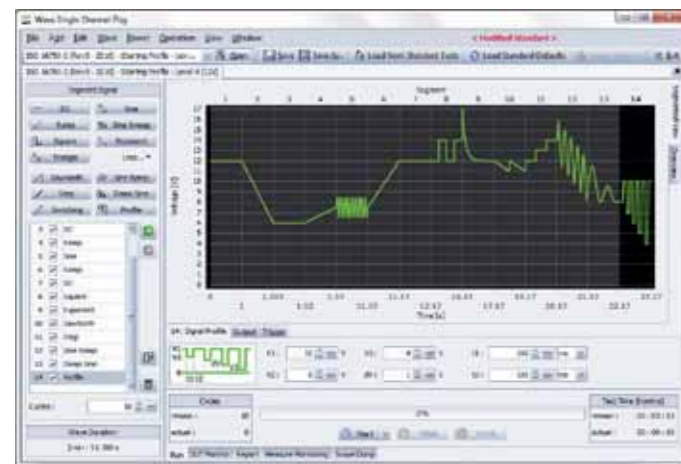


4

- 4 Multi-channel tests**
The AutoWave has two arbitrary outputs (standard). As an option, four outputs are possible. These outputs enable the quick and reproducible execution of tests per Ford CI 230 and Jaguar CI 265, for example.



CREATE COMPLEX TESTS WITH THE SLIGHTEST OF EASE

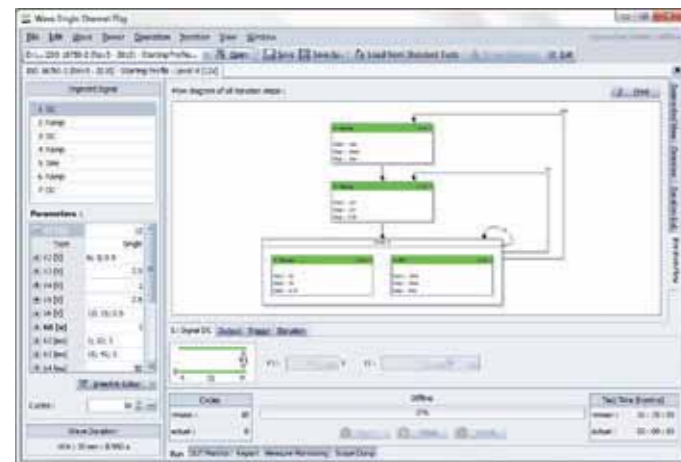


04 CREATE YOUR OWN WAVEFORMS

Create your own wave forms by selecting from predefined segments. A graph displays all of the test parameters in detail. Of course, these can also be changed at any time. And voilà – the new wave form is finished!

You can view the waveform as follows:

- > **Segment view**
This view shows each segment used in an optimized view; the entire wave form is displayed simultaneously.
- > **Overview**
Multiple zoom functions allow a wave form segment to be viewed in the x- or y-axis or in the complete overview. Additional markers show the desired time period. The pan-function moves the visible area in any direction.



05 STATISTICAL TESTS WITH ITERATIONS

With autowave.control, even tests with iterations and pseudo-random scenarios are programmable. In this way, worst case scenarios, such as voltage drops with simultaneous change of segment duration, can be simulated.

- > Iterations of parameters can be defined as a fixed step or in a list
- > Each parameter is assigned an order, which makes tests with any test combination possible.
- > Pseudo-random tests with variable time and test parameters, such as Jaguar test pulse CI 265, are only defined with the total test time.
- > Display of the iteration steps as a list or graph.
- > With the test localization function it's easy to replay only the critical test sequences.

The individual generation of test waveforms is ingenious. Simply select the appropriate n from the predefined segments and modify it as desired. That's it. And the whole thing can even be easily integrated into existing tests.

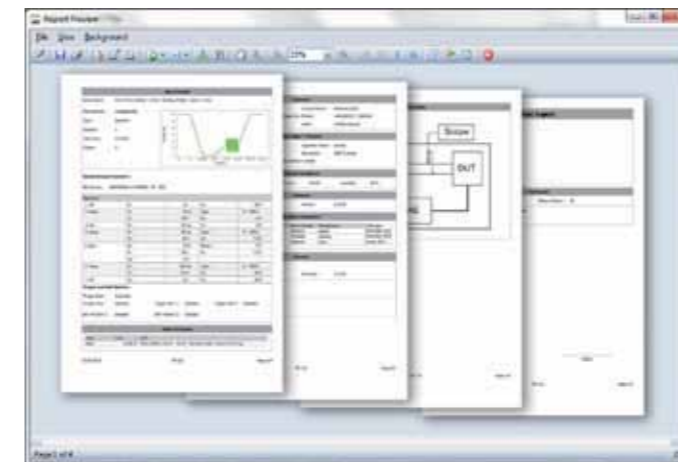
MEASURING AND DOCUMENTING WAVEFORMS



06 INTEGRATION OF EXTERNAL MEASUREMENT DEVICE

The integration of external measurement device with IVD drivers is already programmed into autowave.control. The drivers of the frequently used measurement devices are installed. The transfer function is used to integrate measurement adapters such as voltage probes and current probes into the device library.

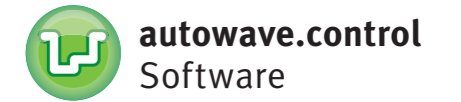
- > Configuration wizard for further measurement devices
- > LAN, USB, RS232, and GPIB ports are supported
- > Set-up wizard for measuring device
- > Graphic measurement results are transferred into the documentation



07 TEST REPORT

Test reports can be created individually, so that only the desired data appear. The database, which you can customize yourself, contains all of the information such as DUT descriptions, test devices, auxiliary equipment (AE), test set-ups, and even recognizes your customers.

- > Generation of reports as RTF, PDF, HTML, or your individual template
- > Information can be deleted or added later as necessary
- > Multiple tests can be combined into a single test report



PFS 200N SERIES

POWER FAIL SIMULATOR



- > Simulator for voltage drops and interruptions
- > Rise/fall time less than 1 μs
- > Electronic switch, short-circuit proof
- > Nominal voltage 60 V DC
- > Manual operation
- > Standard test routines
- > USB and GPIB interfaces

The Power Fail Simulator PFS 200N series is primarily used to meet the requirements of automobile manufacturers for fast voltage drops and interruptions (micro interruptions). Some specifications require

very quick rise times of less than one microsecond, which requires an electronic switch.

VDS 200N SERIES

VOLTAGE DROP SIMULATOR FOR BATTERY SIMULATION



- > Voltages up to 60 V
- > Current up to 200 A (peak 2,000 A)
- > Models with bipolar amplifiers available
- > Low output impedance
- > Powerful DC voltage source

The VDS 200N series is used to simulate various power supply voltage profiles, that are required in international standards and manufacturer specifications. Particularly manufacturer specifications include many important requirements, which are all met by the devices in the VDS 200N series. Furthermore, the VDS 200N is a powerful DC voltage source for DUTs during testing with automotive transients.

The VDS 200N series covers all 3 power supply voltages (42 V, 24 V, and 12 V). Depending on model and use, the current carrying capacity is sufficient for up to reach a steady current of 200 A.

SUPPORTED STANDARDS (EXCERPT)	
International:	ECE, ISO, JASO, SAE, ETS, GOST
Manufacturer*:	Audi, BMW, Mercedes, Porsche, Volkswagen, Ford, General Motors, Chrysler, FIAT, PSA, Renault, Volvo, Jaguar/Landrover, Hyundai/KIA, Honda, Mazda, Nissan, Toyota, Freightliner, Mack Trucks, MAN, Scania, Paccar, Ssangyoung, Tata Motors

*Supported standards, see page 86

PRODUCT RANGE	
PFS 200N30	60 V/30 A, I _{peak} 70 A 500 ms
PFS 200N50	60 V/50 A, I _{peak} 100 A 500 ms
PFS 200N100	60 V/100 A, I _{peak} 150 A 500 ms
PFS 200N150	60 V/150 A, I _{peak} 200 A 500 ms
PFS 200N200	60 V/200 A, I _{peak} > 200 A

GENERATED PULSES	
Drop single	Drop low
Dip single	Dip (sag)
Dips	Switch low
Drop out	Switch high
Micro drop	Cycle 1
Drop high	Cycle 2

TECHNICAL DATA (EXCERPT)	
Abmessungen, Gewicht	PFS 200N30 19"/3 HU, approx. 11 kg PFS 200N50 19"/3 HU, approx. 11 kg PFS 200N100 19"/3 HU, approx. 14 kg PFS 200N150 19"/6 HU, approx. 30 kg PFS 200N200 19"/6 HU, approx. 30 kg
Power supply	115/230 V +10/-15%
Fuses	2 x 1 AT
Serial interface	USB
Parallel interface	IEEE 488, addresses 1 to 30
Analog interfaces	0 V DC to 10 V DC for control of an external DC source (e.g. RDS 200N)

SUPPORTED STANDARDS (EXCERPT)	
International:	ECE, ISO, JASO, SAE, ETS, GOST
Manufacturer*:	Audi, BMW, Mercedes, Porsche, Volkswagen, Ford, General Motors, Chrysler, FIAT, PSA, Renault, Volvo, Jaguar/Landrover, Hyundai/KIA, Honda, Mazda, Nissan Toyota, Freightliner, Mack Trucks, MAN, Scania, Paccar, Ssangyoung, Tata Motors

*Supported standards, see page 86

GENERATED PULSES		
Pulse 2b	Voltage drop	Voltage profile
Pulse 4	Ramp down/Up	Reversed voltage
Pulse 4, sine 2Hz	Ramp up/down	Jump high
Pulse 4, sine 4-5Hz	Ramp down	Jump low
JASO	Ramp up	Triangle high
Cranking	Ramp down/high	Triangle low
Sine	Ramp low/up	Overstress

PRODUCT RANGE	
VDS 200N10	60 V/10 A, I _{Inrush} 15 A
VDS 200N15	60 V/15 A, I _{max.} 15 A
VDS 200N30	60 V/30 A, I _{Inrush} 70 A 500 ms
VDS 200N30.1 bipolar	-5 V bis 60 V/30 A and -5 V bis 30 V/50 A
VDS 200N50	60 V/50 A, I _{Inrush} 100 A 500 ms
VDS 200N50.1 bipolar	-5 V bis 60 V/50 A and -5 V bis 30 V/85 A
VDS 200N100	60 V/100 A, I _{Inrush} 150 A 500 ms
VDS 200N150	60 V/150 A, I _{max.} 150 A **
VDS 200N200	60 V/200 A, I _{max.} 200 A **

** Models with higher I_{Inrush} by request

TECHNICAL DATA (EXCERPT)	
Source impedance	Z _i < 10 mOhm
Voltage deviation	<1 V at resistive load (including inrush current): recovering 63% of the maximum excursion within 100 μs
Ripple voltage	U _r < 0.2 V _{p-p} , min. frequency 400 Hz
Bandwidth	V _{pp} max. 16 V to 25 kHz V _{pp} max. 10 V to 30 kHz V _{pp} max. 6 V to 50 kHz
	V _{pp} max. 3 V to 100 kHz via analog input

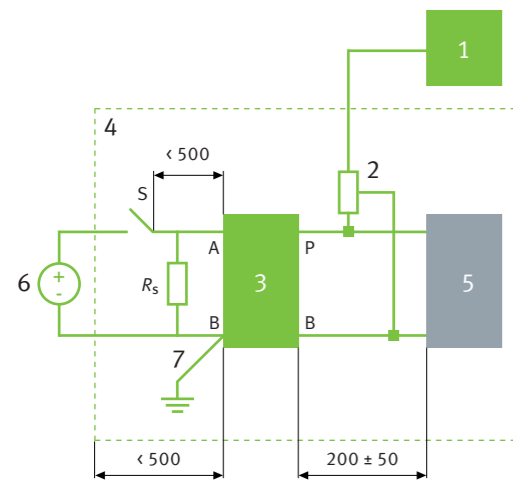
TRANSIENT EMISSIONS TESTS



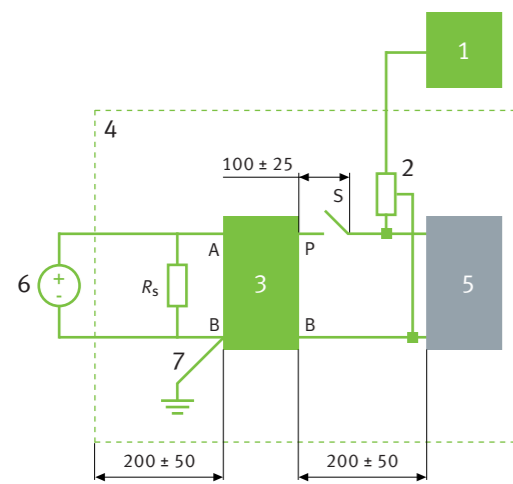
SWITCH & CONTROL: POWER SUPPLY SWITCHES

TEST SET-UP ISO 7637-2

1. Oscilloscope or similar device
2. Probe
3. Artificial network
4. Ground plane
5. DUT
6. Voltage source
7. Ground plane connection < 100 mm
8. On-board power supply switch



Slow pulse (millisecond or more)



Fast pulse (nano to microsecond range)



The BS 200N100 (electronic switch) and the BSM 200N40 (mechanical switch) are used to measure transient emissions from electric vehicle components. A mechanical switch is required by standards for transient emissions greater than 400 volts.

BS 200N100 | AN 200N100 | BSM 200N40

VOLTAGE TRANSIENT EMISSION



- › Peak voltage max. 1,000 V
- › Voltage drop < 0.2 V @ 25 A, < 1.2 V @ 100 A
- › Integrated reverse polarity protection
- › Integrated over-current protection
- › Integrated over-voltage protection

The measuring system includes the electronic switch BS 200N100, the artificial network AN 200N100 and the RS BOX with shunt resistors. For transients greater than 400 volts, the optional mechanical switch BSM 200N40 is available. The electronic power supply switch includes technical highlights that make this measuring system unique, including integrated inverse polarity protection, extremely low voltage drop and

transient measurements up to 1,000 volts. The artificial network AN 200N100 can be used in a wide variety of situations and is highly suitable for use in all standards compliant tests per ISO 7637-2, ISO 11452-4, CISPR 25 and CISPR 16-1-2. The desired standard is selected with the integrated switch. Of course, the impedance characteristics required by the standard are realized as well.

DATASHEETS
FOR ALL OF OUR
EQUIPMENT CAN
BE FOUND AT:
www.emtest.com



SUPPORTED STANDARDS	
AN 200N100	ISO 7637-2:2004, ISO 7637-2:2011, ISO 11452-4, CISPR 25, CISPR 16-1-2
BS 200N100	ISO 7637-2:2004, ISO 7637-2:2011
BSM 200N40	ISO 7637-2:2004, ISO 7637-2:2011

PRODUCT RANGE	
AN 200N100	1,000 V DC, 250 V AC/100 A
BS 200N100	60 V DC/100 A
BSM 200N40	24 V DC/40 A
RS-BOX	Shunt resistors 10 Ω, 20 Ω, 40 Ω, 120 Ω

TECHNICAL DATA (EXCERPT)	
	AN 200N100
Frequency range	0.1–125 MHz
Impedance	50 Ω // 5 μH + 1 Ω
Inrush current	Max. 400 A for 200 ms
Dimensions (L x W x H)	318 x 126 x 122 mm
Weight	2.8 kg

TECHNICAL DATA (EXCERPT)	
	BS 200N100
Voltage drop	< 0.2 V @ 25 A, < 1.2 V @ 100 A
Peak voltage	1,000 V
Inrush current	Max. 400 A for 200 ms
Dimensions (L x W x H)	90 x 125 x 120 mm
Weight	1.3 kg
	BSM 200N40
Contacts	High-purity silver contacts
Dimensions (L x W x H)	90 x 105 x 104 mm
Weight	0.8 kg

CONDUCTED AND RADIATED IMMUNITY



HIGH FREQUENCY: CWS 500N2

BCI testing, required by standards, is done to ensure that electrical automotive components are immune to narrow-band disturbances. The CWS 500N2 is the most cost-effective solution for this testing.

MODULAR DESIGN

The all-in-one solution

- > CONTROLLER WITH STANDARDS LIBRARY
- > SIGNAL GENERATOR 9 kHz–1 GHz for CW, AM and PM
- > DUAL-DIRECTIONAL COUPLER 9 kHz–1 GHz, 200 W
- > 3-CHANNEL MEASUREMENT MODULE - CONFIGURABLE
- > 100 W AMPLIFIER 9 kHz–400 MHz
- > INTEGRATED HF SWITCHING FROM INTERNAL TO EXTERNAL AMPLIFIER
- > OPTIONAL: UP TO 200 W AMPLIFIER 9 kHz–1 GHz

HIGHLIGHTS AT A GLANCE

- > No time consuming cabling
- > Modular design saves space
- > Better reproducibility of testing
- > Familiar, user-friendly operator guidance
- > Significant reduction in calibration time
- > icd.control software for control and documentation
- > Automatic switching between internal and external amplifiers
- > Fully automatic test routines for all standards
- > Integration of up to 4 external devices for measuring, control and monitoring
- > Communication with external software: set-up, control and monitoring (camera systems, Labview, CAN, USB etc.)
- > Optional additional filtering between amplifier and signal output
- > Signal generator and amplifier can be used separately
- > Threshold limit search is fully automated
- > Test set-up diagrams are easy to understand
- > Break function for calibration and test-set up change during the test
- > Calculation of test bench transfer impedance during the test routine
- > Power limitation with software (Pcal x 4) as required for ISO 11452-4



PROMOTES SAFETY

- > Fail 1: Stop, test signal is switched off immediately and, in case of test failure, the test is terminated.
- > Fail 2: - Failure registration without pausing or threshold limit search or - pause + control panel or - interruption of test signal in case of failure in order to observe the failing DUT
- > Built-in safety circuit

SAVES TIME

- > Thanks to advanced testing algorithms and compact design with minimal cabling, you save up to 50% the testing time compared to other solutions.



Testing time
CWS 500N2



Testing time
(competitors' solutions)

EASY TO CONNECT

- > GPIB, USB interfaces
- > DUT monitoring
- > HF signal output to external amplifier
- > Input for current monitoring
- > Inputs and outputs for additional filters
- > Insert loop for pre-amplifier
- > Safety circuit



CWS 500N2

RF TEST SYSTEM FOR BCI



Cables and wiring harnesses in automobiles function as antennas with which many types of transmissions (radio, TV, mobile phone, Bluetooth, etc.) can disturb or affect electronics in the vehicle. With the CWS 500N2 in a clearly arranged test set-up you can generate narrow-band interference signals that are induced via BCI current-injection using the substitution or closed loop method. The BCI clamp is a current transformer that is positioned around the wiring harness. In the substitution method, the disturbance signal is calibra-

ted in a defined calibration circuit and the level is saved and used during the testing. In the closed loop method, the disturbance current is measured with the internal measurement instrument. The control algorithm calculates the output signal and controls the disturbance signal at the required level. The BCI testing method is used in automotive, military and aerospace testing to ensure the immunity of individual components in complex systems.

- > Compact RF test system for reproducible tests
- > Supports BCI, stripline or TEM cell testing
- > Basic frequency range from 9 kHz to 400 MHz
- > Expanded frequency range up to 1 GHz

SUPPORTED STANDARDS	
International:	ISO, JASO, SAE, ETS, GOST
Manufacturer*:	BMW, Mercedes, Volkswagen, Ford, General Motors, Chrysler, FIAT, PSA, Renault, Volvo, Jaguar/Landrover, Nissan, Toyota, MAN, Iveco, Case New Holland, Piaggio
Others:	MIL, VG, aircraft

PRODUCT RANGE	
CWS 500N2	Continuous wave simulator 100 W
CWS 500N2.1	Continuous wave simulator 150 W
CWS 500N2-MF	CWS without internal amplifier for external amplifier use
F-130A-1	BCI clamp (10 kHz) 1 MHz to 400 MHz
F-55	Current clamp 10 kHz to 500 MHz
F-140	BCI clamp 100 kHz to 1,000 MHz
F-65	Current clamp (10 kHz) 100 kHz to 1,000 MHz

GENERATED INTERFERENCE SIGNALS	
	Continuous wave (unmodulated signal)
	Amplitude modulation AM (automotive manufacturer standard) frequency 50 Hz, 80% modulation
	Amplitude modulation AM (medical equipment) frequency 2 Hz, 80% modulation
	Amplitude modulation AM (telecom equipment) frequency 400 Hz, 80% modulation
	Amplitude modulation AM (IEC 61000-4-6) frequency 1 kHz, 80% modulation
	Amplitude modulation AM (automotive manufacturer standard) frequency 1 kHz, 95% modulation
	Pulse modulation (MIL-STD-461 and automotive) frequency up to 1 kHz, 50% duty cycle/period
	Pulse modulation (Alarm System Components EN 50130-4) frequency 1 Hz, 50% duty cycle/period
	FREESTYLE**

TECHNICAL DATA (EXCERPT)	
Frequency range	9 kHz–400 MHz (internal amplifier), 9 kHz–1,000 MHz (external amplifier)
Modulation	CW, AM 1 Hz to 3,000 Hz, 0% to 95%
AM	1 kHz, 80% (IEC 61000-4-6), 1 kHz, 95% (automotive), 400 Hz, 80%, 50 Hz, 80% (automotive), 2 Hz, 80% (IEC 60601-1-2)
Measurement	3-channel power meter, measures forward power (FWD), reverse power (REW), coupled current
Dual directional coupler	Built-in to measure FWD, REW
Interface	GPIB, USB
Power input	115 V or 230 V 50/60 Hz
Fuses	2 x 6.3 AT (115 V) oder 2 x 3.15 AT (230 V)
Dimensions	19"/6 HU
Weight	31 kg

** Amplitude, frequency and modulation can be selected without restriction.

ICD SOFTWARE FOR CWS 500N2



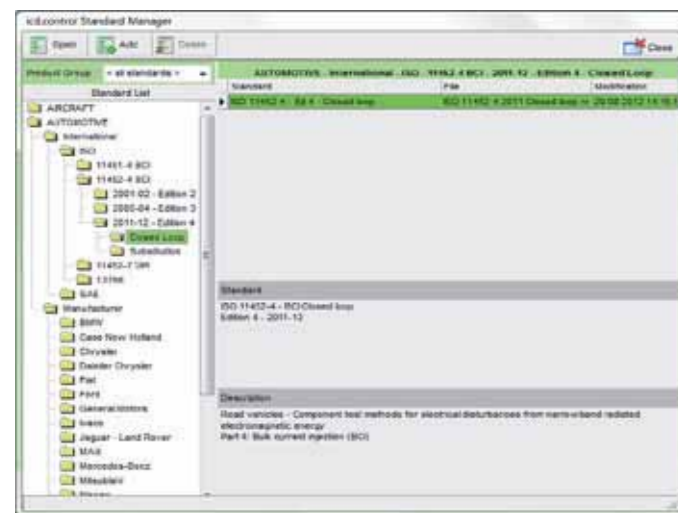
The integrated standards library with images of standard test set-ups and intuitive operation make complex BCI and stripline tests so easy.

ICD.CONTROL SOFTWARE FOR CWS 500N2



SO SIMPLE – AND SIMPLY PERFECT.

ROUTINELY SUCCESSFUL



1



2



3



4



5

ICD.CONTROL FUNCTIONS

01 Standard manager

The standards library enables quick access to a list of standards tests. In each standards list, the test modes are preprogrammed with substitution or closed loop method. Custom tests can also be saved into the standards list.

02 System behavior during DUT monitoring

When using Fail 1 and 2 and an external measuring device

Fail 1: > Stops and ends the test

Fail 2: > The following behavior options can be selected in case of a Fail 2 event:

- > Entry in test graph and report
- > Interruption of test with analysis option
- > Full or semi-automatic disturbance threshold search

Disturbance threshold search

With this function, users can easily determine the disturbance threshold. If the DUT is affected at a certain frequency, the software automatically starts to search for the limit value and reports the final level at which the DUT was unaffected by interference. Control is manual or fully automatic.

03 Vector test routines

You can define and link all of the testing vectors yourself. You can specify the start and end values of the vector (frequency and amplitude), the modulation type, modulation depth, frequency intervals, contact time, etc.

You can create special test frequencies in an Excel file. icd.control uses these values for the test.

04 Set-up for calibration and testing

When you open a test routine, you can select previous calibration data (for BCI clamps and stripline) from the library or create your own calibration file. icd.control displays both the calibration set-up (image 5) and the test set-up (image 4), so you don't have to spend extra time searching in the respective standard.

05 Calibration procedure (e.g. per ISO 11452-4)

When the calibration routine is run, the required test level for each frequency is noted and saved in the respective database. This ensures that in the subsequent test, the entire frequency range can be tested at a consistent level. This eliminates error because in the background, the software monitors all of the operations.



6



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10

ICD.CONTROL FUNCTIONS

06 Measuring device connection

icd.control enables the connection of external measuring equipment such as digital multi meters, oscilloscopes, spectrum analyzers, and all types of measurement value recorders with interfaces. Many measuring devices already exist in the library. The measuring devices installed in the CWS 500N2 are also available in a dedicated field and can be used for additional measurements.

07 Configuring an external measuring device

Here a simple method is used to configure all of the measuring devices used for monitoring the DUT. In addition, trigger conditions, measurement limit values as well as fail functions and alarms can be activated and entered. icd.control support GPIB, RS232, USB and Ethernet interfaces.

08 Active test routines as per ISO 11452-4

Based on the clearly arranged measurement windows and graphics, you can observe the test run at all times. The measured forward and reflected power values as well as the injected current are displayed in addition to the applied power and current values. Moreover, the impedance behavior of the DUT is calculated from the measured values and displayed as well. This delivers detailed information for evaluating the behavior of the DUT.

09 Test routine as per ISO 11452-4 Closed Loop

The closed loop process requires regulation of the output power. The induced current is measured with a probe, compared with the desired level and adjusted. This ensures that the correct level has been tested.

10 Test routine with DUT monitoring

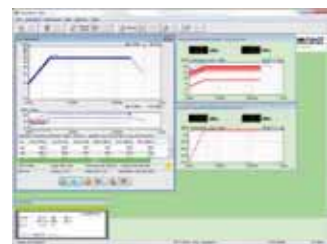
icd.control can control up to 4 measuring devices at once for monitoring/checking the DUT. The respective measurement values are displayed with the frequency information in a clearly arranged graphic.



VISIT US ON THE WEB: www.emtest.com



THE BEST PART: THE MOMENT OF TRUTH



11



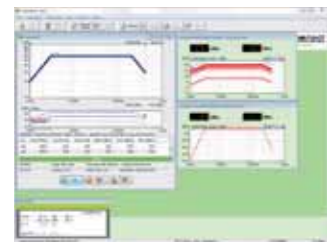
12



13



14



15



16



17

ICD.CONTROL FUNCTIONS

11 Test routine per the substitution method
For the substitution method, the measuring system is initially calibrated in a calibration set-up. The values calibrated here are used in the DUT without taking DUT impedance into account. This method does take the impedance of the entire testing set-up into account for the test and achieves results with good reproducibility.

12 Tests with higher test levels
Per the PSA standard, for example, test level 4 is defined as follows: 300 mA, frequency range 3 MHz to 400 MHz. This test level is a real challenge for conventional systems. The CWS 500N2 with icd.control easily completes this task as well.

13 Analyzer tool
The analyzer tool is a completely new innovation. If the DUT is destroyed, you can interrupt the automatic test routine and use the analyzer tool to change all of the parameters at this point online. This gives you a very accurate picture of the DUT's immunity. All of the individual steps are documented accordingly in order to ensure reproducibility.

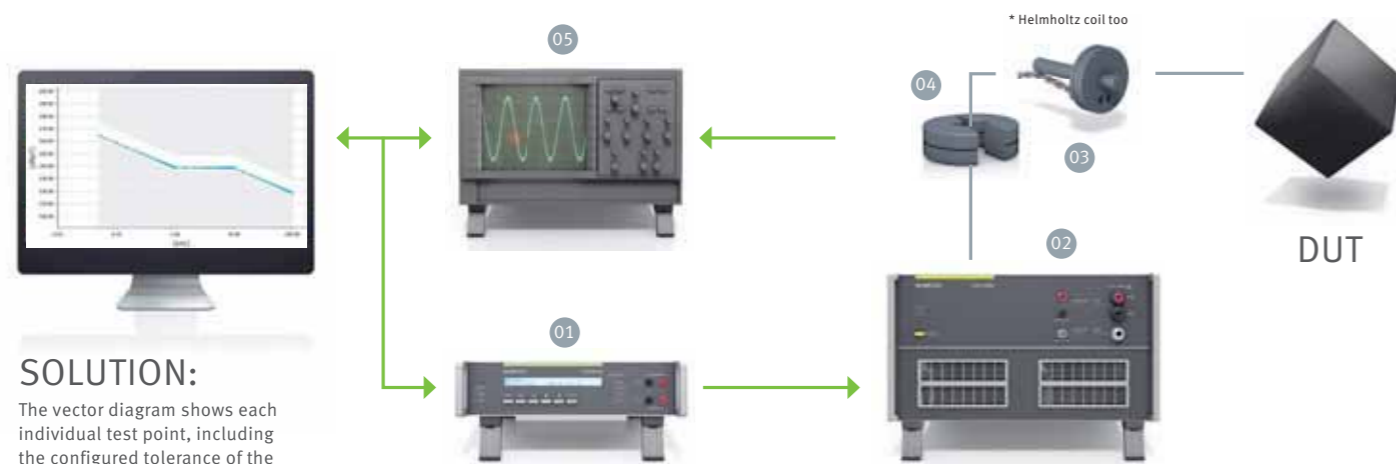
14 Tests with control panel
In the context of a specific immunity test, in failure analyses of the DUT or explanation of damage, you can use the control panel to change each parameter of the test disturbance variable individually as desired. Moreover, the input format of the test disturbance variable can be selected and edited. This allows disturbance tests to be implemented based on specific needs.

15 Documentation
After the test is complete, all of the measurement results are displayed in both table and graphic formats. The icd.control software automatically generates a complete test report in various formats (e.g. RTF, PDF, etc.), including the company logo and specific information requested by the tester.

MAGNETIC FIELD AND VOLTAGE RIPPLE TEST SET-UP

International standards, such as ISO and SAE, require tests with magnetic fields and voltage ripples. The test signal is adapted to the DUT as a frequency sweep. The application is implemented with the substitution or closed loop method. autowave.control adjusts the measurement equipment, e.g. an oscilloscope, for optimum performance and automatically regulates the disturbance signal in the closed loop method based on the measurement values. It really doesn't get any easier!

Magnetic field test per ISO 11452-8 or SAE J1113-22



SOLUTION:
The vector diagram shows each individual test point, including the configured tolerance of the test signal.

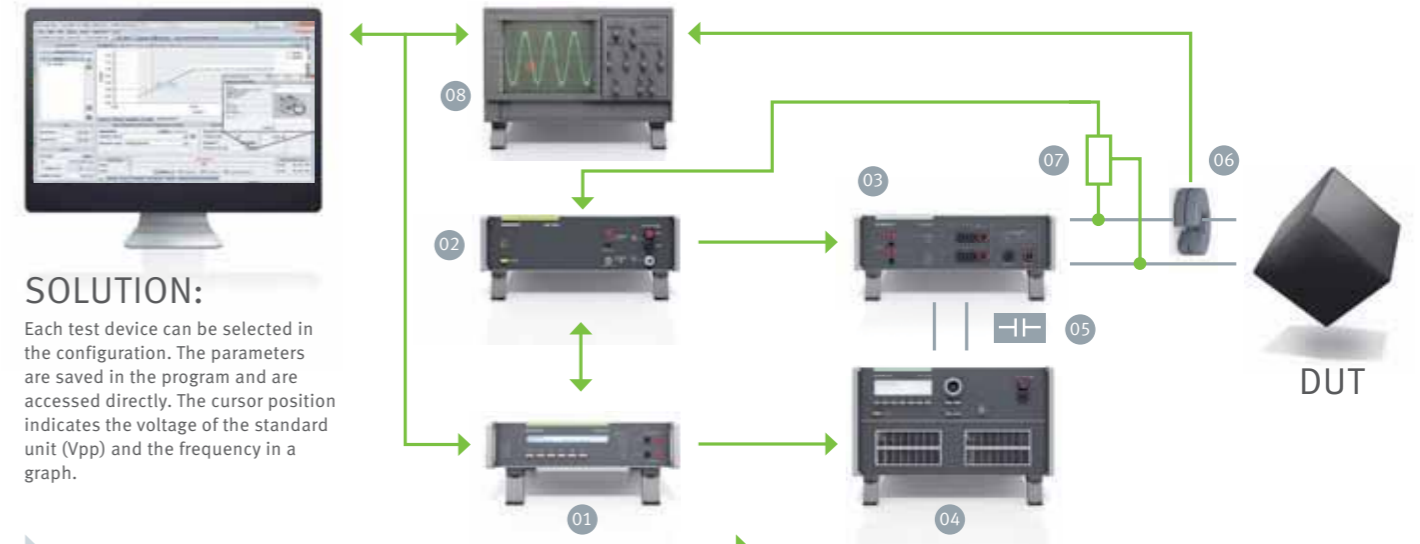
TEST SETUP:

- 01 AutoWave (arbitrary generator)
- 02 AMP 200N1 (amplifier)
- 03 Radiating loops (Helmholtz coil)
- 04 Current probe
- 05 Measuring device (oscilloscope)

TEST DESCRIPTION:

Large magnetic fields such as those found with high currents or in electric motors can disturb electronic components in the vehicle. The ISO 11452-8 standard defines magnetic field tests with the radiated loop antenna or the Helmholtz coil. Many vehicle manufacturers (e.g. Ford EMC-CS 2009.1/RI 140) adapt the international standards using other set-ups and parameters.
No problem for EM TEST equipment!

Voltage ripple per ISO 1145-10 or SAE J1113-2



SOLUTION:
Each test device can be selected in the configuration. The parameters are saved in the program and are accessed directly. The cursor position indicates the voltage of the standard unit (Vpp) and the frequency in a graph.

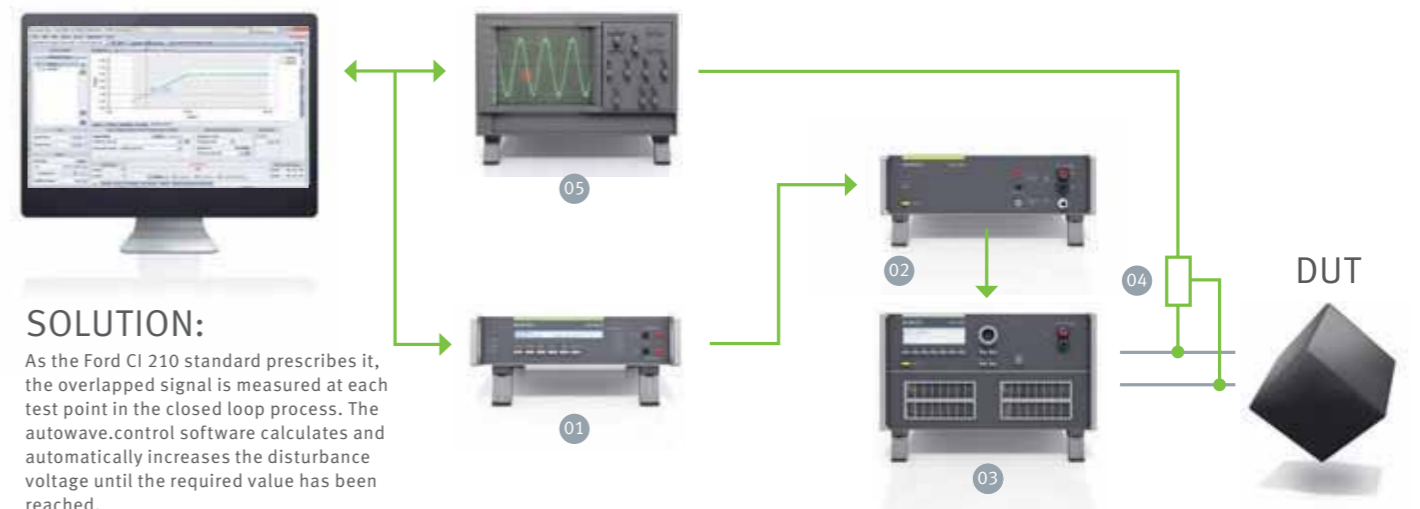
TEST SET-UP:

- 01 AutoWave (arbitrary generator)
- 02 AMP 200N/N1 (amplifier)
- 03 CN 200N1 (transformer)
- 04 VDS 200N series (DC DUT power supply)
- 05 Capacitor (HF short-circuit)
- 06 Current probe
- 07 Voltage probe
- 08 Measuring device (oscilloscope)

TEST DESCRIPTION:

Low frequency disturbance signals in the frequency up to 250 kHz, overlap onto supply and signal lines and affect electronic systems in the vehicle. The disturbance signal generated by the amplifier is transmitted over the audio transformer onto the lines. Many manufacturers vary these tests in terms of voltage and frequency. In CI 250, Ford uses a special transformer coupling with load, which is already integrated in the CN 200N1.

Sine ripple (Ford CI 210 immunity from continuous power line disturbances test pulse)



SOLUTION:
As the Ford CI 210 standard prescribes it, the overlapped signal is measured at each test point in the closed loop process. The autowave.control software calculates and automatically increases the disturbance voltage until the required value has been reached.

TEST SET-UP:

- 01 AutoWave (arbitrary generator)
- 02 AMP 200N/N1 (amplifier)
- 03 VDS 200N series (DC DUT supply and interference signal)
- 04 Voltage probe
- 05 Measuring device (oscilloscope)

TEST DESCRIPTION:

Per Ford CI 210, sine ripples have to be directly superimposed from the DC source onto the supply line. The closed loop method must be applied for the test. The entire measurement and regulation is handled by the autowave.control software.
You can concentrate fully on the DUT, as you should!

AMP 200N SERIES

AMPLIFIER UP TO 250 KHZ



- › 250 W/800 W amplifier
- › Frequency range up to 250 kHz
- › Output voltage max. 140V p-p or 50 Vrms
- › Integrated DDS generator
- › Frequency selective measuring device voltage and current (optional)
- › Application as bipolar DC-supply for 5 A or up to 27A

The AMP 200N series is used to generate high frequency sinusoidal disturbance signals to simulate audio frequencies. Typical tests in the automobile industry are “ripple noise”, “ground shift noise”, or sinusoidal magnetic fields. Transient, customer-specific signals, such as Ford EMC-CS-2009.1, CI 250 are generated.

The AMP 200N series uses the frequency selective measuring device MU-AMP 200N (optional) to record measurement signals with voltage or current input. It is also used for verification and control for magnetic fields and closed loop tests.

CN 200N1

COUPLING NETWORK FOR SINE SUPERPOSITION



- › Two configurable transformers, serial, parallel, can be used individually
- › Integrated low inductive load resistor 0.5 Ω, 250 W
- › Secondary saturation of 50 A per transformer
- › Frequency range from 10 Hz to 250 kHz

Test signals with audio frequencies such as ripple voltage, continuous, or transient disturbances are usually coupled to the lines with audio transformers. The CN 200N1 consists of two audio transformers and one 0.5 Ω load resistor that are individually configurable for different test requirements such as ISO 11452-10, SAE J1113-2, Ford EMC-CS-2009.1, or German Lloyd GL VI-7-2.

The configuration of the transformers in the CN 200N1 can be set up on the primary or secondary side of a serial or parallel switch, so that any standard test can be quickly implemented with little effort. Everything is clearly arranged.

SUPPORTED STANDARDS (EXCERPT)	
› ISO 11452-8	› IVECO 16-2119
› ISO 11452-10	› MAN 3285
› SAE J1113-2	› Jaguar EMC-CS-2010JLR
› SAE J1113-22	› Mitsubishi ES-X82115
› Chrysler CS-11809	› MBN 10284-2
› Chrysler CS-11979	› Nissan 28401 NDS02
› Chrysler DC-11224 Rev.A	› PSA B21 7110 Rev.C
› DaimlerChrysler DC-10615	› Renault 36.00.808/--L
› DaimlerChrysler DC-11224	› Tata TST/TS/WI/257
› FIAT 9.90111 (Rev. 1, 2010-05)	› Volvo STD 515-0003
› Ford EMC-CS-2009.1	› VW TL 825 66
› GMW 3172 and GMW 3097	› GLloyd VI-7-2

PRODUCT RANGE	
AMP 200N	DC–250 kHz, 250 W nominal
AMP 200N1	DC–250 kHz, 800 W nominal

TECHNICAL DATA (EXCERPT)	
Output voltage	50 Vrms, max. 140Vpp
Harmonic distortion THD	< 0.1%
Protective function	Over-current, over-temperature monitoring
AMP 200N	
Output current	max. 5 A _{rms} (range 25 V) max. 2.5 A _{rms} (range 50 V)
Dimensions	19" 3 HU (500 x 449 x 133 mm)
Weight	approx. 18 kg
AMP 200N1	
Output current	max. 16 A _{rms} , 27 A DC (range 25 V) max. 8 A _{rms} , 13 A DC (range 50 V)
Dimensions	19" 3 HU (500 x 449 x 286 mm)
Weight	approx. 36 kg
Measurement (optional)	Frequency selective 10 Hz–250 kHz
Input channels	2, voltage and current
Measurement certainty	Better than 5%

GENERATED PULSES	
	Sine
	Sine ripple
	Ground shift ripple
	Transient
	DC
	H-field

SUPPORTED STANDARDS (EXCERPT)	
› ISO 11452-10	› Mitsubishi ES-X82115
› SAE J1113-2	› Tata TST/TS/WI/257
› Chrysler CS-11809	› MIL STD 461 F CS 101
› DaimlerChrysler DC-10615	› MIL STD 461 F CS 109
› EMC-CS-2010JLR	› MIL STD 704
› Ford EMC-CS-2009.1	› GLloyd VI-7-2

PRODUCT RANGE	
CN 200N1	DC, 10 Hz–250 kHz, 250 W nominal

GENERATED PULSES	
	Sine ripple
	Ground shift ripple
	Transient

TECHNICAL DATA (EXCERPT)	
Frequency range	10 Hz - 250 kHz
Audio power	2 x 200 W
Saturation (secondary)	2 x max. 50 A (AC or DC)
Turns ratio	2:1 step down
Primary configuration	Single, serial or parallel input
Secondary configuration	Single, serial or parallel input
Resistance	0.5 Ω / 250 W selectable
Dimensions	19", 3 HU (395 x 449 x 133 mm)
Weight	approx. 24 kg

ESD TESTS



ESD 30N

THE INNOVATIVE ESD SIMULATOR UP TO 30 KV



- › Up to 30 kV contact and air discharge
- › Easy-to-change R/C modules
- › Integrated rechargeable battery
- › Bleed-off function
- › Pulse voltage measurement

Electrostatic discharges that travel from one human being to another or one object to another can disturb or even destroy sensitive electronic components or control systems. The ESD 30N is an ESD test generator for simulating ESD pulses for high voltages of up to

30 kV for contact and air discharge. The ESD 30N exceeds the requirements of ISO 10605 and is perfect for automotive test applications.

DITO

THE ULTIMATE ESD SIMULATOR UP TO 16.5 KV



- › Ergonomic design
- › Modular concept
- › Easy to operate
- › LiFePO4 battery with integrated protection switch
- › Very low weight (870 g)

A discharge can contain many thousands of volts. The EM TEST dito and the ESD 30N are among the most innovative ESD simulators that produce IEC 61000-4-2 and ISO 10605 compliant discharges as well as meeting other standard requirements.

The dito can be operated with just one hand. With the powerful, advanced LiFePO4 battery more than 70,000 pulses can be produced at 16.5 kV. This capacity is certainly enough for a good day's work.

SUPPORTED STANDARDS (EXCERPT)	
International:	ECE, ISO, JASO, SAE, ETS, GOST
Manufacturer*:	Audi, BMW, Mercedes, Porsche, Volkswagen, Ford, General Motors, Chrysler, FIAT, PSA, Renault, Volvo, Jaguar/Landrover, Hyundai/KIA, Honda, Mazda, Nissan, Toyota, Freightliner, Mack Trucks, MAN, Scania, Paccar, Ssangyoung, Tata Motors
*Supported standards, see page 86	
GENERATED PULSES	
	Contact discharge positive
	Contact discharge negative
	Air discharge positive
	Air discharge negative

TECHNICAL DATA (EXCERPT)	
ESD per IEC 61000-4-2 and ISO 10605	
Test voltage	Max. 30 kV
Discharge	Air/contact discharge
Polarity	Positive/negative
Hold time	› 5 seconds
Contact discharge	0.2–30 kV
Rise time	0.8 ns +/- 25%
First peak current value	3.75 A/kV
Contact discharge	150 pF/330 Ω 330 pF/330 Ω 150 pF/2,000 Ω 150 pF/150 Ω 330 pF/2,000 Ω Customer-specific
Weight of ESD 30N	5.1 kg
Weight of P 30N	Approx. 1.25 kg
Special technical features	› Display of RC values › Display of discharge mode, AD or CD › Bleed-off function for DUT discharge › integrated temperature and air humidity sensor › USB and Opto-Link interface › esd.control software › AC or DC current supply › integrated rechargeable battery

SUPPORTED STANDARDS (EXCERPT)	
International:	ECE, ISO, JASO, SAE, ETS, GOST
Manufacturer*:	Audi, BMW, Mercedes, Porsche, Volkswagen, Ford, General Motors, Chrysler, FIAT, PSA, Renault, Volvo, Jaguar/Landrover, Hyundai/KIA, Honda, Mazda, Nissan, Toyota, Freightliner, Mack Trucks, MAN, Scania, Paccar, Ssangyoung, Tata Motors
*Supported standards, see page 86	
GENERATED PULSES	
	Contact discharge positive
	Contact discharge negative
	Air discharge positive
	Air discharge negative

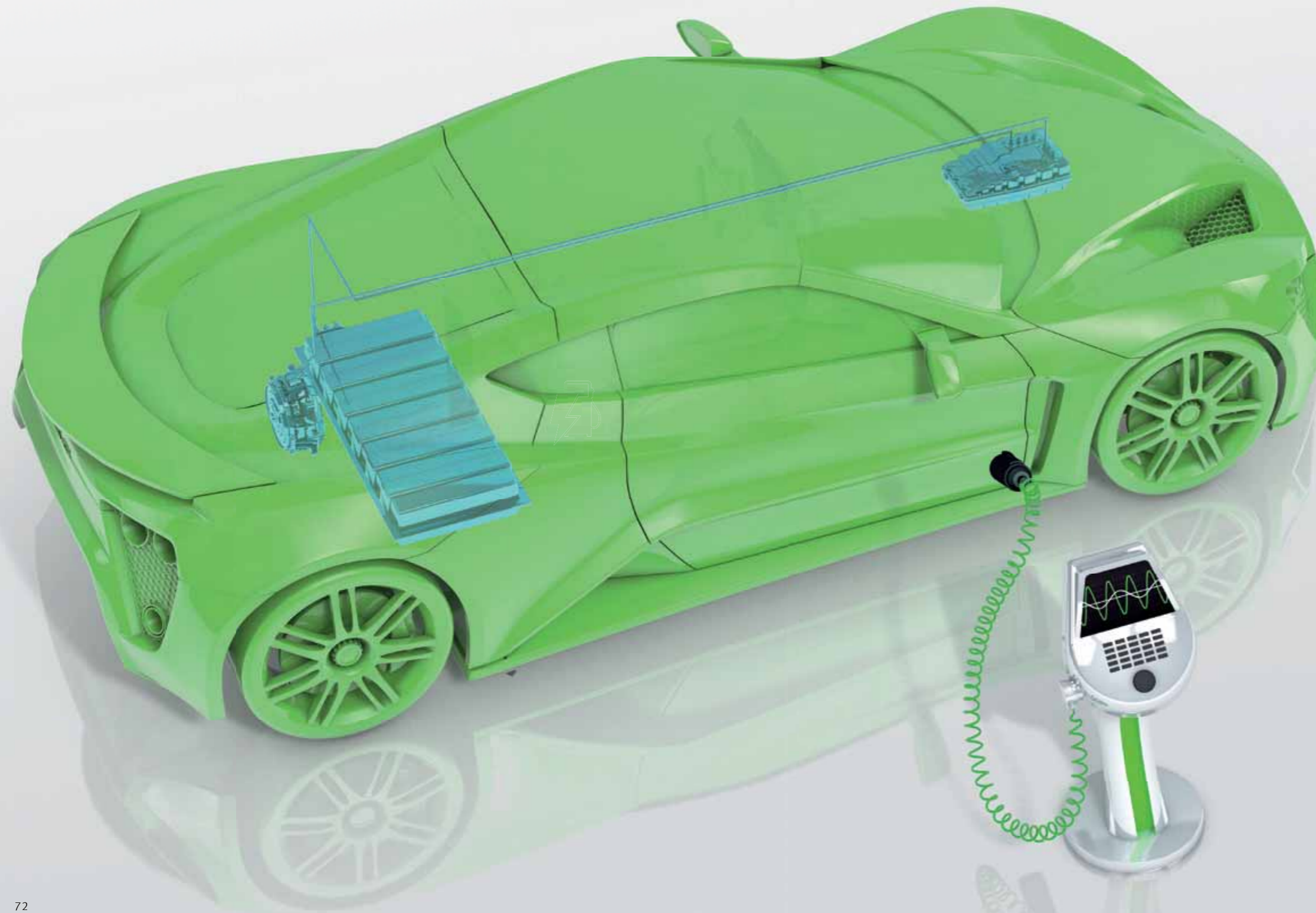
TECHNICAL DATA (EXCERPT)	
ESD per IEC 61000-4-2 and ISO 10605	
Test voltage	0.5–16.5 kV
Discharge	Air/contact discharge
Polarity	Positive/negative
Hold time	› 5 seconds
Contact discharge	0.5 kV–10 kV
Rise time	0.8 ns +/- 25%
First peak current value	3.75 A/kV
R/C networks	150 pF/330 Ω 330 pF/330 Ω 150 pF/2,000 Ω 150 pF/150 Ω 330 pF/2,000 Ω Customer-specific
Special technical features	› Display of RC values › Display of discharge mode, AD or CD › Opto-Link interface › esd.control software › Battery or power supply › LiFePO4 battery with integrated protection switch
Weight	870 g

HYBRID AND ELECTRIC VEHICLES



ELECTRIFYING SOLUTIONS FOR HYBRID AND ELECTRIC VEHICLES

Hybrid and electric vehicles present entirely new challenges to the industry. New standards must be satisfied. EM TEST provides you with the right test equipment with its own control software.



TEST REQUIREMENTS FOR HYBRID AND ELECTRIC VEHICLES:

ECE R10	EMC for vehicles and subassemblies
IEC 61851-21	Electric vehicle conductive charging system –Part 21: Electric vehicle requirements for conductive connection to an a.c./d.c. supply
IEC 61851-21-1	Electric vehicle conductive charging systems –Part 21-1: Electric vehicle onboard charger EMC requirements for conductive connection to an a.c./d.c. supply
IEC 61851-21-2	Electric vehicle conductive charging system –Part 21-2: EMC requirements for OFF board electric vehicle charging systems

TEST SPECIFICATIONS FOR CHARGING STATIONS FOR PLUG-IN HYBRID AND ELECTRIC VEHICLES:

IEC/EN 61851-22	Electric vehicle conductive charging system –Part 22: a.c. electric vehicle charging station
IEC/EN 61851-23	Electric vehicle conductive charging system –Part 23: d.c. electric vehicle charging station
IEC/EN 61851-24	Electric vehicle conductive charging system –Part 24: Digital communication between a d.c. EV charging station and an electric vehicle for control of d.c. charging
CHAdeMO	Conductive load systems –DC quick-loading stations up to 60 kW

Electric vehicles must be rechargeable everywhere, at any time. The interoperability of vehicles of different manufacturers with regard to the infrastructure of various operators must be ensured. To this end, various international boards are cooperating to standardize the standards.



... WE MEET THEM: THE NEW STANDARDS

Charging stations for AC and DC/PHEV and electric vehicles / RESS / Immunity tests on shielded HV+ and HV- lines. The EM TEST test equipment is already designed for AC / DC voltages of up to 1,000 V and currents of up to 200 A.



NETWAVE SERIES 1-PHASE

- › Programmable AC/DC source, 7 kVA
- › Stable AC source for harmonics and flicker testing
- › Generation of harmonic voltages per IEC 61000-4-13
- › High output spectrum: DC, 5 kHz
- › Output voltage 360 VAC/±500 VDC
- › High inrush and peak current capability up to 200 A



NETWAVE SERIES 3-PHASE

- › Programmable AC/DC source
- › High output spectrum: DC–5 kHz
- › Output up to 90 kVA AC, 108 kW DC
- › Output voltage up to 3*360 VAC, ±500 V DC
- › High inrush and peak current capability
- › Recovery max. up to nominal output (optional)
- › Generation of harmonic voltages per IEC 61000-4-13



DPA 500, DPA 503 AIF 503N SERIES

- › DPA 500/503: Measurement and analysis system for harmonics and flicker per IEC 61000-3-2 (16 A) and IEC 61000-3-12 (>16 A and < 75 A)
- › AIF 503N series: Flicker impedance up to 75 A per IEC 61000-3-3 (16 A) and IEC 61000-3-11 (<75 A)



UCS 500N SERIES (WITH SPECIAL CNI 503)

- › UCS 500N series up to 7 kV test voltage per IEC 61000-4-4 EFT/Burst per IEC 61000-4-5 Surge per IEC 61000-4-11 Power fail
- › Coupling filter, CNI 503 xxx AC up to 3 x 690 V/16 A to 200 A DC up to 1000 V/32 A to 200 A



PFS 503N SERIES 3-PHASE

- › PFS series, simulators for voltage drop and interruption for DUT currents up to 100 A per IEC 61000-4-11 (16 A) and per IEC 61000-4-34 (> 16 A)

DPA 500N | NETWAVE 7.3

1-PHASE TEST SYSTEM FOR HARMONICS AND FLICKER



Connection to a public power supply network requires compliance with the limit values for circuit feedback associated with harmonics and flicker. A stable power supply with pure sinusoidal voltage, a harmonics measuring device and flicker impedance are required for normative measurement. The AC sources of the NetWave series are well suited for measuring harmonics and flicker for 1-phase and 3-phase DUTs and for simulating supply

- > As per ECE Regulation No. 10, IEC 61851-21, Ed. 2, Part 21
- > Testing for harmonics and flicker
- > Simulation of disturbances in power supply networks
- > Harmonics test routine as per the testing methods of ECE Regulation No. 10



network disturbances. For the measurement of harmonics, ECE Regulation No. 10 requires measuring between 80% and 100% charging current. The DPA 500N already has this routine in its standards library and automatically terminates the test when the threshold value is reached.

NETWAVE (3-PHASE) | DPA 503N | AIF 503N

HARMONIC AND FLICKER SYSTEM/GENERATION OF HARMONICS AND INTERHARMONIC VOLTAGES



Connection to a public power supply network requires compliance with the limit values for circuit feedback associated with harmonics and flicker. A stable power supply with pure sinusoidal voltage, a harmonics measuring device and flicker impedance are required for normative measurement.

- > ECE R10/IEC 61851-21/IEC 61000-4-13
- > AC/DC source 3 x 360 VAC, +/- 500V DC
- > Output power up to 90 kVA AC, 108 kW DC
- > Currents up to 100 A per phase
- > High inrush and peak current capability



In accordance with IEC 61851-21, harmonic and interharmonic voltages must also be simulated and tested. To meet all of these requirements, EM TEST has the ultimate 3-phase testing system, which consists of NetWave, DPA 503N and the AIF 503N flicker impedance.

SUPPORTED STANDARDS (EXCERPT)	
> IEC 61000-3-2	> IEC 61000-4-14
> IEC 61000-3-3	> IEC 61000-4-17
> IEC 61000-3-11	> IEC 61000-4-27
> IEC 61000-3-12	> IEC 61000-4-28
> JIS C 61000-3-2	> IEC 61000-4-29
> IEC 61000-3-2 as per ECE R10 test procedure	> MIL-ST D 704
> IEC 61000-3-12 as per ECE R10 test procedure	> RTC A/DO 160 Section 16
> IEC 61000-4-7	> Airbus
> IEC 61000-4-15	> Boeing
> IEC 61000-4-13	

TECHNICAL DATA (EXCERPT)	
NETWAVE 7.3 (1-phase)	
Output voltage	0 V–360 V AC, 0 V +/- 500 V DC
Output current	26 A (RMS) continuous 47 A (RMS) short term (max. 3 sec.) 200 A peak value
Frequency range	DC–5,000 Hz
Frequency accuracy	100 ppm
Distortion (THD)	Better than 0.5% @50/60 Hz
Output voltage stability	Better than 0.1%
Output voltage accuracy	Better than 0.5%
DPA 500N	
Input channels	2 (1 x voltage and 1 x current)
Data memory	Internal SSD (Solid State Drive)
Voltage input range	10 V–530 V rms
Voltage accuracy	Better than 0.4% of the displayed value
Current input range	16 A continuous, 50 A short term
Internal accuracy current	Better than 0.4% of the displayed value Better than 0.05% based on 16 A
Harmonics	U, I, Phase P, Q, S (2nd to 50th order)
Flickerimpedanz	Phase line: 0.24 ohm + J0.15 ohm Neutral line: 0.16 ohm + J0.10 ohm
Rack (25 HU)	(L x W x H) 800 mm x 555 mm x 1,280 mm

APPLICATIONS	
Harmonics up to 16 A	DC simulation
Flicker up to 16 A	Power fail (dips)
AC source, 1-phase	Power fail (interruption)
Flat curve	
Frequency sweep	
Harmonics	

SUPPORTED STANDARDS (EXCERPT)	
> IEC 61000-3-2	> IEC 61000-4-15
> IEC 61000-3-3	> IEC 61851-21
> IEC 61000-3-11	> IEC 61851-22
> IEC 61000-3-12	> IEC 61000-4-13
> JIS C 61000-3-2	> IEC 61000-4-14
> IEC 61000-3-2 as per ECE R10 test procedure	> IEC 61000-4-17
> IEC 61000-3-12 as per ECE R10 test procedure	> IEC 61000-4-27
> IEC 61000-4-7	> IEC 61000-4-28
	> IEC 61000-4-29
	> MIL-ST D 704

APPLICATIONS	
Harmonics up to 16 A	Frequency sweep
Harmonics > 16 A–75 A	Harmonics
Flicker up to 16 A	DC simulation
Flicker up to > 16 A–75 A	Power fail (dips)
AC source, 1-phase	Power fail (interruption)
AC source, 3-phase	
Flat curve	

TECHNICAL DATA (EXCERPT)	
NETWAVE (3-phase)	
Output voltage	0 V–360 VAC, 0 V +/- 500 V DC
Output current/phase	26 A to 100 A (RMS) continuous 47 A to 150 A (RMS) short term (max. 3 sec.) 200 A to 500 A peak value
Frequency range	DC–5,000 Hz
Frequency accuracy	100 ppm
Distortion (THD)	Better than 0.5% @50/60 Hz
Output voltage stability	Better than 0.1%
Output voltage accuracy	Better than 0.5%
DPA 503N	
Input channels	6 (3 x voltage and 3 x current)
Data memory	Internal SSD (Solid State Drive)
Voltage input range	10 V–530 V rms
Voltage accuracy	Better than 0.4% of the displayed value
Current input range	75 A continuous, short term 150 A
Internal accuracy current	Better than 0.4% of the displayed value Better than 0.05% based on 16 A
Harmonics	U, I, Phase P, Q, S (2nd to 50th order)
AIF 503N	
Flicker impedance Zref	Phase line: 0.24 ohm + J0.15 ohm Neutral line: 0.16 ohm + J0.10 ohm
Flicker impedance Ztest	Phase line: 0.15 ohm + J0.15 ohm Neutral line: 0.10 ohm + J0.10 ohm
Phase current	16 A, 32 A, 63 A, 75 A, depending on model

UCS 500N7 | CNI 503B7.3

TRANSIENT TEST SYSTEM



For the testing of electric vehicles and their components, the multifunctional generators UCS 500N5 and UCS 500N7 are the universal generators for all transients and power fail tests. For a single phase DUT, the integrated coupling/decoupling network can be used. The test rack with the UCS 500N7 is expanded with the three-phase coupling network CNI 503B7.3.

- > Per ECE Regulation No. 10, IEC 61851-21, ed. 2, part 21
- > Burst and surge tests
- > AC: 3-phase up to 690 V/200 A
- > DC: up to 1,000 V/200 A



The test system lends itself to testing 1-phase and 3-phase DUTs with voltage supplies of up to 3 x 480 V AC (versions up to 690 V are available). A DC voltage input (which can be switched off using a special DC switch) is integrated into the test system for DC DUTs or DUTs on HV+ or HV- lines. DUTs can be tested with up to 1,000 V DC and a current of up to 200 A.

PFS 503N | MV 3P40100DS (3-PHASE)

3-PHASE TEST SYSTEM FOR VOLTAGE DIPS AND INTERRUPTIONS



In a connection to a public power supply network, load changes such as starting an engine result in voltage drops. These are due to voltage drops in the supply lines. Short circuits and switching operations in the power supply network lead to brief voltage interruptions. The PFS 503N with the 3-phase motor variac MV 3P40100DS simulates these voltage drops and interruptions.

- > IEC 61851-21/IEC 61000-4-11/IEC 61000-4-34
- > DUTs up to 3 x 690 V and 100 A per phase
- > Inrush current up to 1,000 A
- > AC supply with real star-delta circuit
- > 3-phase column transformer with magnetic coupling



Unique here is the switch from 3-phase motor variac into star-delta operation, which is used to simulate the actual operational conditions. Within 1 μs, the Power Fail Generator PFS 503N switches the supply voltage from the power supply to the lower voltage.

SUPPORTED STANDARDS (EXCERPT)	
> IEC 61000-4-4	> ANSI/IEEE C62.41
> IEC 61000-4-5	> IEC 61851-21, Ed. 2, Part 21
> IEC 61000-4-8	> IEC 61851-22, Ed. 2, Part 22
> IEC 61000-4-9	> IEC 61851-23, Ed. 2, Part 23
> IEC 61000-4-11	> IEC 61851-24, Ed. 2, Part 24
> IEC 61000-4-12	
> IEC 61000-4-29	> ECE Regulation Nr. 10
> EN 61000-6-1	> Various manufacturer specifications
> EN 61000-6-2	

GENERATED PULSES	
EFT burst positive	Power fail (interruption)
EFT burst negative	Ringwave positive
Surge positive	Ringwave negative
Surge negative	H-field 50/60 Hz
Power fail (dips)	H-field pulsed

TECHNICAL DATA (EXCERPT)	
UCS 500N7	
EFT/Burst	per EN/IEC 61000-4-4
Test voltage	200 V–5,500 V ± 10%
Rise time (tr)	5 ns ± 30% to 50 ohm
Pulse duration (td)	50 ns ± 30% to 50 ohm
Polarity	Positive/negative
Surge	per EN/IEC 61000-4-5
Test voltage	250 V–7,000 V ± 10%
Rise time	1.2 μs ± 30%
Time to half value	50 μs ± 20%
Short-circuit current	max. 3.5 kA, 8/20 μs
Polarity	Positive / negative / alternating
CNI 503B7.3	
CDN	3 x 480 V, 32 A AC, 1,000 V, 32 A DC
EFT/Burst	up to 5.5 kV
Surge	up to 7 kV
DUT models	3 x 690 V AC/1,000 V DC, up to 200 A
Rack	
Dimensions (L x W x H)	25 HU, 800 mm x 555 mm x 1,280 mm

SUPPORTED STANDARDS (EXCERPT)
> IEC 61000-4-11
> IEC 61000-4-34
> IEC 61851-21
> IEC 61851-22
> IEC 61000-6-2

APPLICATIONS
DIP Star 40%
DIP Delta 40%
DIP Star 70%
DIP Delta 70%
Drop Star
Drop Delta
Interruption

TECHNICAL DATA (EXCERPT)	
PFS 503N (3-phase)	
PFS 503N32	3 x 480 V AC, 32 A per phase
PFS 503N63	3 x 480 V AC, 63 A per phase
PFS 503N100	3 x 480 V AC, 100 A per phase
PFS 503Nxx.1	3 x 690 V AC, 32–100 A per phase
Frequency	50 / 60 Hz
Peak current	> 500 A (32 A model) > 1,000 A (63 A / 100 A models)
Rise times	1 μs to 5 μs in a pure 100 Ω load
Synchronization	0°–360°, 1° resolution
MV 3P40xxDS	Motor variac
Design	3-phase column transformer
Operation mode	Star or Delta operation
Control range voltage	Star: 0–270 V (L-N) Delta: 0–400 V (L-L) 16 A, 32 A, 63 A, 100 A
Current range	16 A, 32 A, 63 A, 100 A
Voltage accuracy	1%
V 3P40xxDS	Transformer with fixed taps
Design	Column transformer fixed taps at 0%, 40%, 70%, 80%, 100%
Operation mode	Star or delta operation
Models for	16 A, 32 A

ACCESSORIES FOR SUCCESSFUL TESTING

WHAT ELSE DO YOU NEED?

EMC tests are complex test procedures and must be conducted with a wide variety of DUTs under very different power supply conditions. Coupling and decoupling devices are needed for many different types of lines. Often the generated signals and injected currents must be verified as precisely as possible. The corresponding measurement, control, monitoring, and registering devices must be integrated for this purpose.

What it all boils down to is that a large number of accessories are needed because they play a significant role in test execution.

AN 2050N SERIES

Artificial network for ISO 7637 or CISPR 25/ISO 11452-4



- > AN 2050N per ISO 7637
- > AN 2050N1 per CISPR 25 / ISO 11452-4
- > 250 V AC, 400 V DC, 50 A AC/DC

The unipolar EM TEST artificial network of the AN 2050 series simulates the impedance of the cabling in the HF/VHF range, in particular for testing disturbance voltage in on-board power supplies, e.g. in the automotive and aerospace industries as well as for the military. The AN 200N100 is available for currents up to 100 A.

CDN 10615N100

Coupling network for DC 10616 load dump pulse



- > Transmission of load dump pulses to DC lines
- > DC 10615, PSA B21 7110, Renault 36 00 808 G
- > 60 V/100 A

The coupling network superimposes a voltage pulse onto a DC supply line. A 0.5 Ω resistor in the pulse circuit limits the maximum pulse current without voltage drop in the DC supply path.

RDS 200N

E.g. Ford EMC-CS-2009.1 CI 230 A, B1, B2, C



- > Accessory for AutoWave, PFS 200Nx

The RDS 200 is an externally controlled DC voltage source with an integrated current sink for generating variations in on-board power supply. As an additional voltage source, the RDS 200N supplements the automobile system if the standard requires further voltage waves for the test.

RS BOX

Load resistor for measuring transient emissions



- > Accessory for shunt resistance: BS 200N100, AN 200N100

The load resistor simulates the impedance of parallel consumers in the same load circuit. The low inductance resistors in the RS Box are designed for use in 24 V power supply voltages.
> Resistor values: 10 Ω, 20 Ω, 40 Ω, 120 Ω

RCB 200N1

TRANSIENT GENERATOR FOR IMMUNITY TESTS PER FORD AND JAGUAR



- > Certified by Ford
- > Built-in trigger generator
- > Generator according to Ford EMC-CS-2009.1 and Jaguar
- CI 220 A1, A2-1, A2-2, C-1, C-2
- C-1, C-2 and Jaguar EMC-CS-2010JLR
- CI 260 pulse F
- RI 130 pulse A2-1, A2-2

The EM TEST transient generator RCB 200N1 is designed strictly in accordance with Ford EMC-CS-2009.1 and is officially certified by Ford. Based on a switch with a Potter & Brumfield 12 V AC relay as well as specially defined components (such as inductors, capacitors, resistors, and switches), "real transients" are simulated.

The RCB 200N1 contains a microprocessor control, which always sets the switch correctly, adheres to the test times precisely, and runs the correct test cycles. Other than the standard vehicle battery, you don't need any other control device.

SUPPORTED STANDARDS
> Ford EMC-CS-2009.1
> Jaguar EMC-CS-2010JLR V1.2 (2012-06)

GENERATED PULSES	
Pulse CI 220, A1	Pulse RI 130 A2-1
Pulse CI 220, A1	Pulse RI 130 A2-2
Pulse CI 220, A2-1	
Pulse CI 220, A2-1 & C-1	
Pulse CI 260 F	

TECHNICAL DATA (EXCERPT)	
Input voltage	U = 13.0 V +0.5 V -1.0 V per Ford, custom
Current	20 A max ± 10%
Fuse	20 A DUT voltage supply
Trigger input	5 V-12 V (positive edge)
Approval	Approved by Ford
Design	Per Ford standard EMC-CS-2009.1 Jaguar EMC-CS-2010JLR v1.2 (2012-06)
Voltage range	11 V-15 V
Dimensions	330 mm x 230 mm x 112 mm (L x W x H)
Weight	6.20 kg

CA BS 200N

Calibration load impedance



- > High precision calibration load
- > For max. 28 V DC/50 A
- > 0.6 Ω in series with 50 μH
- > Integrated resistors 10Ω, 20Ω, 40Ω, 120 Ω for emission measurements

The electronic switch BS 200Nx is verified with the CA BS 200N in accordance with ISO 7637-2. The switch time of 300 ns +/- 20% is to be verified at a defined load of 0.6 Ω in a series with 50 μH.

CA ISO

Calibration set for automotive transients as per ISO 7637-2



- > Compact resistor box
- > Resistors: 0.5; 1; 2; 4; 10; 20 and 50 Ω

The resistor box CA ISO contains all load resistors for verifying micro pulse and load dump generators per international and manufacturer standards. The values of the load resistors have a very high temperature stability and accuracy (+/- 1%) as well as a low inductance.

CA EFT KIT

Calibration kit for EFT/burst verification



- > Calibration kit
- > 50 Ω and 1,000 Ω calibration resistors with integrated voltage divider
- > Measurement adapter for 4mm and 6 mm banana plugs

The CA EFT kit contains all the necessary calibration resistors and an adapter set for a transfer to a coaxial connection. The pulse verification of burst generators is executed with 50 Ω and 1,000 Ω loads at the coaxial output and with 50 Ω at the DUT output.

ACC

Capacitive coupling clamp per ISO 7637-3



> Accessory for UCS 200N

The capacitive coupling clamp is used to couple the pulses 1, 2, 3a + 3b onto the signal and data lines.

BCI- AND MONITORING PROBES

F-130A-1, F-140, F-55, F-65



- > Current coupling clamp F-130A-1 (10 kHz-400 MHz)
- F140 (100 kHz-1 GHz)
- > Calibration fixture FCC-BCICF-1, FCC-BCICF-2
- > HF Current measuring clamp F-55, (10 kHz-500 MHz), F-65 (100kHz-1GHz)

The BCI Bulk current injection clamps are used for couple narrow-band interferences onto wiring harness. The inducted HF current is measured by the HF current measuring clamps for a calibration or closed loop method tests.



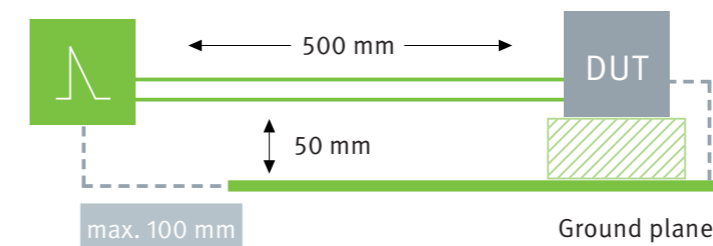
EVERYTHING IN ONE PACKAGE FOR A SUCCESSFUL TEST: ISO RACK.

When a test system consists of multiple devices, there are many advantages to building a rack. The entire cabling can be optimally integrated into the rack. The EMC-compatible grounding concept is designed with one central grounding connector for the complete system. The fixed wiring inside the rack guarantees consistent reproducibility of test pulses. Connectors for safety circuits and emergency stop switches for the entire test system meet all requirements of a safe work environment.

ISO RACK ADVANTAGES

- > All the test equipment fits
- > Complete cabling of the power supply, GPIB/USB control lines
- > Central reference ground plane per ISO 7637-2
- > All internal simulators are connected to this reference ground, external ground; connections during component testing are connected here.
- > Safety circuit, emergency stop switch
- > Main switch for measuring device power supply

SCHEMATIC SET-UP



SUPPORTED STANDARDS

EM TEST has the complete EMC standard library. Specifically, the predefined tests, also in the field of manufacturer standards, make it easy to test in compliance with standards. The software supports all common standards and is continuously updated.

SUPPORTED STANDARDS (continuously updated)	
A	ETS 300 340 ETS 300 342-1 ETSI EN 301 489-1 EN prEN 50498
Audi test catalog Audi voltage tests	
B	F
BMW 600 13.0 (Part 1) BMW 600 13.0 (Part 2) BMW GS 95002 BMW GS 95003-2 BMW GS 95024-2-1 BMW GS 95024-2-2 BMW GS 95025-1 BMW GS 95026 BMW airbag control devices BMW QV65013	FAW Diesel ECU MY06.0 Fiat 9.90110 Fiat 9.90111 Fiat 7-Z0441 Fisker C1.810.EMC.100.01 Ford WDR 00.00EA Ford ES-XW7T-1A278-AB Ford ES-XW7T-1A278-AC Ford EMC-CS-2009 .1 Freightliner 49-00085
C	G
Case New Holland ENS0310 Chrysler PF 9326 Chrysler LLC DC-10615 Chrysler LLC DC-11224 Chrysler LLC CS-11809 Chrysler LLC CS-11979 China Motor Company ES-X82010-0 Claas CN 05 0215 Cummins 14269 (982022-026) Cummins 14269 (982022-028)	General Motors GM 9103 P General Motors GM 9105 P General Motors GMW 3097/3100 General Motors GMW 3097 General Motors GMW 3172 Germanisch. Lloyd GL VI 7-2 Gost 28751-90
D	H
DAF BSL 0006-100 DaimlerChrysler PF-10540 DaimlerChrysler PF-10541 DaimlerChrysler DC-10614 DaimlerChrysler DC-10615 DaimlerChrysler DC-11224 DaimlerChrysler DC-10842 Defence Standard DS 59-411 (Part 3) DIN 72300-2	Honda 3982Z-SDA-0030 Honda 8129 Hyundai/Kia ES 39110-00 Hyundai/Kia ES-95400-10 Hyundai/Kia ES 95682-50 Hyundai/Kia ES 95910-29 Hyundai/Kia ES 96100-01 Hyundai/Kia ES-96100-02 Hyundai/Kia ES 96200-00 Hyundai/Kia ES 96202-01
E	I
EN prEN 50498 ECE R10 ETS 300 329	ISO 7637-1 ISO 7637-2 (1990, 2004, 2011) ISO 7637-2.3 ISO 7637-3

SUPPORTED STANDARDS	
I	P
ISO 10605 ISO 11451-4 ISO 11452-4 ISO 11452-5 ISO 11452-8 ISO 11452-10I ISO 13766 ISO 14982 ISO 16750-2 ISO/CD 21848.4 Iveco 16-2099 Iveco 16-2101 Iveco 16-2103 Iveco 16-2119	Porsche EMC specifications Porsche EMC specifications sheet 2007 Porsche hardware specifications sheet Proton PES-6022 Peugeot/Citröen PSA B21 7090 Peugeot/Citröen PSA B21 7110
J	R
Jaguar/Land Rover CI265 Jaguar/Land Rover EMC-CS-2010JLR JASO D001-94 JASO D902-95 John Deere JDQ 53.3	Renault 36.00.808/-- Renault 36.00.400/ RCTA DO-160-16
M	S
MAN 3285 Mack Trucks 606GS15 Mazda MES PW 67600 Mazda MES PW 67602 Mercedes-Benz AV EMV Mercedes-Benz MBN 22 100-2 Mercedes-Benz MBN 10 615 Mercedes-Benz MBN LV 124-1 Mercedes-Benz MBN 10 284-2 Mercedes-Benz MBN 10 284-4 Mercedes-Benz 211 000 42 99 Mitsubishi ES-X82010 Mitsubishi ES-X82114 Mitsubishi ES-X82115 MIL-STD-461	SAE J 1113 - 2 SAE J 1113 - 4 SAE J 1113 - 11 SAE J 1113 - 12 SAE J 1113 - 13 SAE J 1113 - 22 SAE J 1772 SAE J 2139 SAE J 2628 SAE J 1455 for trucks Scania TB1400 Scania TB1700 Scania TB1901 Smart DE1005B Ssangyoung SES-E-922
N	T
Nissan 28400 NDS02 Nissan 28400 NDS03 Nissan 28400 NDS07 Nissan 28401 NDS02	Tata Motors TST/TS/WI/257 Toyota TSC 3500G Toyota TSC 3590G Toyota TSC 6203G Toyota TSC 7001G Toyota TSC 7021G Toyota TSC 7034G Toyota TSC 7203G Toyota TSC 7306G Toyota TSC 7544G
O	V
OEM LV 124 OEM LV 148	Volvo 1579908 Volvo STD 515-0003 Volkswagen VW TL810 00 Volkswagen VW TL820 66 Volkswagen VW TL821 66 Volkswagen VW TL823 66 Volkswagen VW TL824 66 Volkswagen VW TL825 66 VW 80000 VW 80101 VW 82148
P	Y
Paccar CS0016 Paccar CS0013 Piaggio 7431	Yamaha ETS-Y-11-07

EM TEST SERVICES: CUSTOMIZED SOLUTIONS FOR EVERY NEED.



SERVICE & SUPPORT: ALWAYS AVAILABLE



COMPREHENSIVE SERVICE PORTFOLIO

Our comprehensive professional service and support solutions leave nothing to be desired. Commissioning, briefings, updates, maintenance, and repair work are given high priority at EMTEST. Thanks to the outstanding infrastructure, optimum service project management, and special thanks to our highly qualified and motivated employees, we literally achieve the highest level of EM TEST service quality.

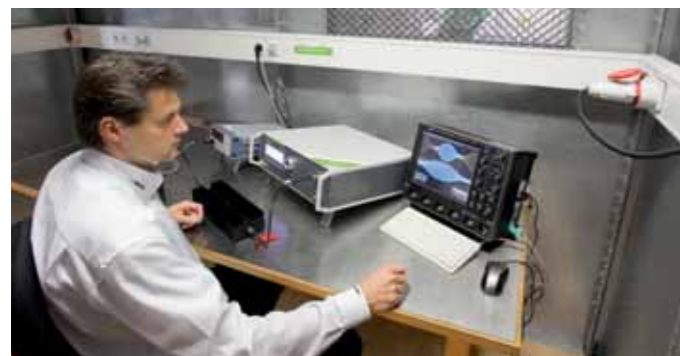
EMC TEST LAB: YOUR PRODUCT SUCCESS IS OUR MISSION



PROFESSIONAL SUPPORT RIGHT FROM THE START

EM TEST provides assistance starting early in the development phase of your products with technical coaching and constructive measures such as layout optimization, device and power supply design, grounding and shielding, micro-processor board design, and much more. Not only do we determine the interference potentials, but we also simultaneously develop suitable interference suppression and elimination measures in cooperation with you, our customer.


ACCREDITED CALIBRATION LABS: ABSOLUTE COMPLIANCE



REPRODUCIBLE, FAST AND COMPETENT

The accredited EMTEST calibration laboratories in Reinach (CH) and Kamen (D) perform competent, independent and reasonably priced calibrations according to DIN EN ISO/IEC 17025 as well as national and international standards.

And not just for EMTEST products, but also for equipment from other manufacturers. On site as well, if you like.



EMC SEMINARS & WORKSHOPS: SUCCESS CAN BE LEARNED



EMC EXPERTISE FOR BEGINNERS AND PROFESSIONALS

Our EMC seminars and workshops are geared to our customers' requirements in the fields of research, development and production.

All EMTEST lecturers have practical experience and impart their expertise vividly and up close in a personal manner to the participants. Maximum knowledge transfer and learning success are guaranteed.

EXTENDED WARRANTY: PRACTICALLY FOR FREE



A LONGER WARRANTY? OUR PLEASURE.

Calibrations at EMTEST offer more. Your EMTEST product will be checked by request and, if necessary, adjusted immediately. We are so convinced of our products' quality that the warranty time can be extended to 3 years by having the equipment calibrated at any of the accredited EM TEST calibration laboratories during the 2-year warranty period. This means you get an extra warranty year almost for free.

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