

# NETWAVE SERIES (3-PHASE)

## THREE-PHASE MULTIFUNCTIONAL AC/DC POWER SOURCES



### FOR TESTS ACCORDING TO ...

- › AIRBUS, BOEING
- › DO 160 Section 16, Section 18
- › LV 123
- › BMW GS 95023
- › MBN LV 123
- › VW 80300
- › VW 80303
- › PSA B21 7110
- › IEC/EN 61000-3-2, -3-12
- › IEC/EN 61000-3-3, -3-11
- › JIS C 61000-3-2
- › IEC/EN 61000-4-11, -4-29, -4-34
- › IEC 61000-4-13
- › IEC 61000-4-14
- › IEC 61000-4-17
- › IEC 61000-4-27
- › IEC 61000-4-28
- › MIL STD 461
- › MIL-STD-704

### NETWAVE - SIMULATION OF THE MOST REQUIRED POWER SUPPLY PHENOMENON

The NetWave Series (3-phase) are three-phase AC/DC power source, specifically designed to fully meet the requirements as per the standards IEC/EN 61000-4-13, -4-14, -4-28 and in addition to pre compliance testing to -4-27. It is also used as a DC power source to cover the requirements as per the standards IEC/EN 61000-4-17 (Ripple on DC) and IEC/EN 61000-4-29 for voltage dips and interruptions on DC supplies. The NetWave series is well suited for testing inverters (e.g. solar power, wind power) and e-vehicles like LV 123 standard. Additionally, the NetWave series (3-phase) offers the necessary capabilities for avionics testing as per DO-160, Airbus ABD0100 and Boeing as well as per MIL-STD-704 and is perfectly suited as reference source for Harmonics and Flicker testing.

Optionally the NetWave 3-phase series can be equipped with a power-recovery module to absorb fed-back power (AC/DC) up to nominal power of the NetWave.

### HIGHLIGHTS

- › **Wide Power Bandwidth; DC - 5 kHz**
- › **Output Power up to 270 kVA AC / 324 kW DC**
- › **Output up to 3\*690 VAC (p-p), +/-1120 VDC**
- › **High Inrush Current Capability**
- › **Power-recovery up to nominal power (optional)**

### APPLICATION AREAS

- |  |  |
|--|--|
|  AUTOMOTIVE |  AVIONICS         |
|  INDUSTRY   |  MILITARY         |
|  MEDICAL    |  RENEWABLE ENERGY |

**TECHNICAL DETAILS**

**BENEFITS**

**NETWAVE - THE POWERFUL MULTITALENT FOR AC AND DC SUPPLY SIMULATION**

The programmable 3-phase AC/DC power sources with their wide frequency bandwidth offer powerful waveform generation capabilities for various test applications in the EMC area and for avionics testing. Based on a Dual-Processor technology, with an integrated high-performance PC, a digital signal processor (DSP) and equipped with a hard disk, the NetWave Series is capable to generate and record waveforms in realtime.

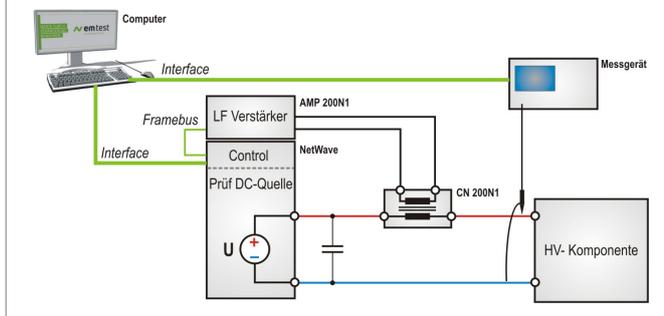
According to standard requirements a pure sinusoidal voltage is needed for harmonics and flicker measurements. The output voltage of the NetWave Series is therefore guaranteed to have a very low distortion (THD) of less than 0.1% regardless of the load. No matter whether waveforms are programmed of segments or of single points (normally resulting in MBs of data) the NetWave masters it all.

Interfaces like GPIB and Ethernet are common features with the NetWave Series.

**AUTOMOTIVE APPLICATIONS**

**THE COMPLETE SOLUTION FOR HV COMPONENTS TESTING**

With the NetWave it is possible for the first time to check HV components up to 1120 VDC according to LV 123. The additional LF amplifier AMP 200Nx uses the CN 200Nx to couple voltage ripples up to 450 kHz to the supply lines. With the closed loop method, the netwave.control software measures the voltage ripple and continuously controls the amplitude.



**SOFTWARE NET.CONTROL**

**EDITING, DOCUMENTING AND MANAGING YOUR WAVEFORMS AND STANDARD TESTS**

net.control is the new all-in-one software platform to easily and conveniently control the NetWave Series. By means of net.control the user can program any kind of waveforms either composed from segments or points and download them into the NetWave. Enhanced graphic tools are at hand to adjust the waveform according to individual requirements.

net.control provides a library of an extensive compilation of predefined segments as well as tens of thousands of standard test routines as per EMC and avionics standards.

net.control is also handling any waveform recorded by other method (e.g. captured by an oscilloscope) or imported as Excel or CSV files. All waveforms can be downloaded into the NetWave.

net.control offers an enhanced reporting tool to generate test and measuring reports and can be used under Windows 7, Windows 8 and Windows 10.



## TECHNICAL DETAILS

## MODEL OVERVIEW

3-PHASE NETWAVE-MODELS	
NetWave	3-phase Multifunction AC/DC source
NetWave 20.x	22,5 kVA AC / 27 kW DC support with wheels
NetWave 30.x	30 kVA AC / 36 kW DC, support with wheels
NetWave 67.x	67 kVA AC / 72 kW DC, support with wheels optional
NetWave 90.x	90 kVA AC / 110 kW DC, stationary placement
NetWave 108.x	108 kVA AC / 150 kW DC, stationary placement

## TECHNICAL DETAILS

NETWAVE 20	
Output voltage	0 V - 3*300 V AC (p-n) 0 V - +/- 425 V DC, (850 VDC*)
Output current	26 A (RMS) continuous 47 A (RMS) short-term (max. 3 s) 200 A repetitive peak

NETWAVE 20.2	
Output voltage	0 V - 3*360 V AC (p-n) 0 V - 3*620 V AC (p-p) 0 V - +/- 500 V DC, (1000 VDC*)
Output current (@ max. 300 V AC/360 V DC)	26 A (RMS) continuous 47 A (RMS) short-term (max. 3 s) 200 A repetitive peak

NETWAVE 20.3	
Output voltage	0 V - 3*400 V AC (p-n) 0 V - 3*690 V AC (p-p) 0 V - +/- 1120 V DC
Output current (@ max. 300 V AC/360 V DC)	26 A (RMS) continuous 47 A (RMS) short-term (max. 3 s) 200 A repetitive peak
PowerRecovery 20	Included

## TECHNICAL DETAILS

NETWAVE 30	
Output voltage	0 V - 3*300 V AC (p-n) 0 V - +/- 425 V DC, (850 VDC*)
Output current	33 A (RMS) continuous 66 A (RMS) short-term (max. 3 s) 250 A repetitive peak

NETWAVE 30.2	
Output voltage	0 V - 3*360 V AC (p-n) 0 V - 3*620 V AC (p-p) 0 V - +/- 500 V DC, (1000 VDC*)
Output current (@ max. 300 V AC/ 360 V DC)	33 A (RMS) continuous 66 A (RMS) short-term (max. 3 s) 250 A repetitive peak

NETWAVE 30.3	
Output voltage	0 V - 3*400 V AC (p-n) 0 V - 3*690 V AC (p-p) 0 V - +/- 1120 V DC
Output current (@ max. 300 V AC/ 360 V DC)	33 A (RMS) continuous 66 A (RMS) short-term (max. 3 s) 250 A repetitive peak
PowerRecovery 30	included

NETWAVE 67	
Output voltage	0 V - 3*300 V AC (p-n) 0 V - +/- 425 V DC, (850 VDC*)
Output current	75 A (RMS) continuous 100 A (RMS) short-term (max. 3 s) 400 A repetitive peak

NETWAVE 67.2	
Output voltage	0 V - 3*360 V AC (p-n) 0 V - 3*620 V AC (p-p) 0 V - +/- 500 V DC, (1000 VDC*)
Output current (@ max. 300 V AC/ 360 V DC)	75 A (RMS) continuous 100 A (RMS) short-term (max. 3 s) 400 A repetitive peak

OPTION FOR DC EXTENDED VOLTAGE RANGE	
* with option	OPT-3 DC-EVR, Double the DC voltage

**TECHNICAL DETAILS**

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NETWAVE 67.3	
Output voltage	0 V - 3*400 V AC (p-n) 0 V - 3*690 V AC (p-p) 0 V - +/- 1120 V DC
Output current (@ max. 300 V AC/360 V DC)	75 A (RMS) continuous 100 A (RMS) short-term (max. 3 s) 400 A repetitive peak
PowerRecovery 60	included

NETWAVE 90.2	
Output voltage	0 V - 3*360 V AC (p-n) 0 V - 3*620 V AC (p-p) 0 V - +/- 500 V DC, (1000 VDC*)
Output current (@ max. 300 V AC/360 V DC)	100 A (RMS) continuous 150 A (RMS) short-term (max. 3 s) 500 A repetitive peak

NETWAVE 90.3	
Output voltage	0 V - 3*400 V AC (p-n) 0 V - 3*690 V AC (p-p) 0 V - +/- 1120 V DC
Output current (@ max. 300 V AC/360 V DC)	100 A (RMS) continuous 150 A (RMS) short-term (max. 3 s) 500 A repetitive peak
PowerRecovery 90	included

NETWAVE 108.3	
Output voltage	0 V - 3*400 V AC (p-n) 0 V - 3*690 V AC (p-p) 0 V - +/- 1120 V DC
Output current (@ max. 300 V AC/360 V DC)	100 A (RMS) continuous 150 A (RMS) short-term (max. 3 s) 500 A repetitive peak
PowerRecovery 108	included

**TECHNICAL DETAILS**

EXTENDED CAPABILITIES FOR NETWAVE	
Simple mode	Optimized control for integration of the Netwave into existing automation environments (for example Matlab)
SourceAC mode	PLL synchronization with other voltage sources
Trigger channel	Extended trigger functions
Segment "Step"	Ramping of voltage and/or frequency in constant time windows
Extern mode	Control of the NetWave by an external control signal

NETWAVE XX.3	
Lic-3 NetIndustry	included
Lic-3 NetAutomotive	included

## TECHNICAL DETAILS

## GENERAL DATA (ALL MODELS)

SPECIFICATIONS	
Output frequency	DC - 5,000 Hz
Frequency accuracy	100 ppm
Output connectors	Safety lab connectors CEE type 32 A (only for NetWave 20.x and NetWave 30.x)
Interfaces	GPIO Ethernet RS 232 (input from DPA analyser) Frame bus (internal system bus)
Phase accuracy	Resolution 1°
Output noise	< 50 V : 110 mV rms > 50 V : 320 mV rms
Slew Rate	8V/μs

REGULATION	
Voltage sense	Internal or external, 4 wires
Distortion (THD)	Less than 0.5%, @50/60 Hz
Output voltage Stability	Better than 0.1 %
Output voltage Accuracy	Better than 0.5 %
Max. compensatable drop on wires	5 % of V nominal
Current limiter	5 A to I <sub>max</sub> Stop / Continuous (behavior)
Protection	Over current Over voltage Over temperature Low voltage

TRIGGER AND DUT MONITORING	
Trigger	2 inputs, 2 outputs
DUT monitors	2 inputs, configurable

## GENERAL DATA (ALL MODELS)

WAVEFORM GENERATOR	
Segment types DC	DC, Ramp, Square, Triangle, Sawtooth, Step, Sine, Sine sweep, Sine ramp, Damped sinewave, Sine ripple, Profile, Square sweep, Noise, Sine Dwell, Sinc, Harmonic, Exponent ...
Segment types AC	Sine, Modulation, Sine sweep, Sweep on Sine, Sine up/down, Sine unbalance, Overswing, Sine offset, Sine Dip, Harmonic, Interharmonic, Interharmonic step, Harmonic distortion ...
Segment duration	Unlimited

DISPLAY AND CONTROLS	
Display	2-Line LCD, 40 characters
LED indicators	Power On Active output channel Trigger Functional status hard disk
Operation	6 function keys, Test On key: ON/OFF key for the power source

DIMENSIONS (ROLLS AND CRANE SUPPORT INCLUDED)	
NetWave 20.x	approx. 1785 x 930 x 755 mm approx. 1785 x 1210 x 755 mm (recovery)
NetWave 30.x	approx. 1785 x 930 x 755 mm approx. 1785 x 1210 x 755 mm (recovery)
NetWave 67.x	approx. 2080 x 1205 x 970 mm approx. 2080 x 1615 x 970 mm (recovery)
NetWave 90.2	approx. 2080 x 1810 x 970 mm
NetWave 90.3	approx. 2080 x 2410 x 970 mm
NetWave 108.3	approx. 2080 x 2410 x 970 mm

## TECHNICAL DETAILS

## GENERAL DATA (ALL MODELS)

## WEIGHT (ROLLS AND CRANE SUPPORT INCLUDED)

NetWave 20.x	approx. 740 kg approx. 810 kg (recovery)
NetWave 30.x	approx. 740 kg approx. 810 kg (recovery)
NetWave 67.x	approx. 1,180 kg approx. 1,380 kg (recovery)
NetWave 90.2	approx. 1,700 kg
NetWave 90.3	approx. 2,000 kg (recovery)
NetWave 108.3	approx. 2,000 kg (recovery)

## MAINS

Supply voltage	3 x 400 V (3P,PE); optional 3 x 480 V (3P,PE)
Input current	50 A/90 A (NetWave 20.x)* 70 A/140 A (NetWave 30.x)* 140 A/212 A (NetWave 67.x)* 210 A/318 A (NetWave 90.x)* 252 A/381 A (NetWave 108.x)* * the higher figure represents the 3s short-term current
Line frequency	45 Hz - 65 Hz
Connectors	Screwed terminals

## AMBIENT CONDITIONS

Temperature	5°C - 35°C
Rel. humidity	10 % - 90 %, non condensing
Atmospheric pressure	86 kPa (860 mbar) to 106 kPa (1,060 mbar)

## OPTIONS

## OPTIONAL SOFTWARE

Lic-3 NetIndustry	Software license for industrial standards IEC 61000-4-13, -4-14, -4-17, -4-27, -4-28
Lic-3 NetHarmonics	Software license for harmonics analysis as per IEC 61000-3-2, -3-12 and ECE-R10
Lic-3 NetFlicker	Software license for flicker analysis as per IEC 61000-3-3 and -3-11
Lic-3 NetAircraft DO	Software license for DO-160 standard for NetWave-series (3-phase)
Lic-3 NetMilitary	Software license for MIL-STD-704 standard for NetWave-series (3-phase), requires filter box F-Box 3 for LDC / HDC 103
Lic-3 NetAircraft Airbus	Software license for AIRBUS standards for NetWave-series (3-phase)
Lic-3 NetAircraft Boeing	Software license for BOEING standards for NetWave-series (3-phase) Requires NetWave model for 360 VAC or higher
Lic-3 NetAutomotive	Software license for Automotive application

## AMP EXTENDED FREQUENCY

Opt-3 AmpHigh	Software license for AMP 200Nx for extended frequencies up to 500 kHz
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## CASCADE SOURCE

Opt-3 CS	Option to connect in series two NetWave sources, switched in series mode (double voltage), e.g. 2x NW90.2 -> NW90.2CS
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## MULTI SOURCE

Opt-3 MS	Option to connect in parallel three NetWave sources, switched in parallel mode (triple power), e.g. 3x NW90.2 -> NW 270.2MS
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## TECHNICAL DETAILS

## OPTIONS

## NW-BOARD MEASURING MODULE

Channels	Built in 6 channel (3-phase) measurement board for 3* voltage 3* current
Voltage ranges	25 V, 50 V, 100 V, 250 V, 550 V, unipolar or bipolar
Current ranges	10 A, 25 A, 50 A, 100 A, 220 A, unipolar or bipolar
Resolution	16 Bit
Accuracy	Voltage: better than 0.2 % Current: better than 0.5 %
Frequency range	DC - 100 kHz
Sampling rate	5Hz - 200 kHz, selectable
Memory	Min. 40 GB on hard disk, File size max. 1 GB
Measuring Parallel Mode	NetWave 20.x NetWave 30.x

## PARALLEL MODE HARDWARE (OPTION PARALLELMODE 20/30, 67, 90, 108)

Parallel Mode 20/30, 67, 90, 108	The parallel mode connect all three internal sources together in parallel. The common 1-phase output is on a separate terminal block for EUT connection. During parallel mode disconnect the 3-phase terminals from the source.
NetWave 20.x	78 A (RMS) continuous 141 A (RMS) short max. 3s 400 A repetitive peak
NetWave 30.x	99 A (RMS) continuous 198 A (RMS) short max. 3s 500 A repetitive peak
NetWave 67.x	225 A (RMS) continuous 300 A (RMS) short max. 3s 600 A repetitive peak
NetWave 90.x	300 A (RMS) continuous 450 A (RMS) short max. 3s 1,000 A repetitive peak
NetWave 108.x	300 A (RMS) continuous 450 A (RMS) short max. 3s 1,000 A repetitive peak

## OPTIONS

## POWER RECOVERY (OPTION POWERRECOVERY 20/30, 67, 90, 108)

Available for	all 3-phase NetWave models
Mains voltage	400 V +/- 10% (45 Hz - 65 Hz)
Recoverable power	up to nominal AC/DC power of the individual NetWave model
PowerRecovery 20	for NetWave 20.x Max. 22.5 kVA AC / 27 kW DC 26 A (RMS) continuous 47 A (RMS) short max. 3 s 200 A repetitive peak
PowerRecovery 30	for NetWave 30.x Max. 30 kVA AC / 36 kW DC 33 A (RMS) continuous 66 A (RMS) short max. 3 s 250 A repetitive peak
PowerRecovery 67	for NetWave 67.x Max. 67 kVA AC / 72 kW DC 75 A (RMS) continuous 100 A (RMS) short max. 3 s 400 A repetitive peak
PowerRecovery 90	included in Netwave 90.3, Max. 90 kVA AC / 110 kW DC 100 A (RMS) continuous 150 A (RMS) short max. 3 s 500 A repetitive peak
PowerRecovery 108	included in Netwave 108.3, Max. 108 kVA AC / 132 kW DC 100 A (RMS) continuous 150 A (RMS) short max. 3 s 500 A repetitive peak
Power factor	> 0.92 (cos phi) at full load

## DC EXTENDED VOLTAGE RANGE

OPT-3 DC-EVR	Double DC voltage range, using two phases simultaneously, available only for 3-phase NetWaves
NetWave 20, 30, 67, 90, 108	Extended from 425 VDC to 850 VDC
NetWave X0.2 models	Extended from 500 VDC to 1000 VDC
NetWave X0.3 models	Extended from 560 VDC to 1120 VDC included

## ROLLS FOR NETWAVE 67.X

Support with wheels	Support with wheels for NetWave 67.x
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## TECHNICAL DETAILS

## ACCESSORIES

## FILTER BOX F-BOX 3-60

Application	Lowpass filter for smoothing the dc voltage for very low ripple application < 500 mV
Standard	MIL-HDBK-704-7 HDC 103 MIL-HDBK-704-8 LDC 103 other applications with low ripple signals
Application MIL-HDBK	Test condition A (10 Hz) Test condition B (25 Hz)
Voltage	AC: 230 V DC: 500 V
Current	60 A
Frequency	max. 60 Hz
Dimension (LxWxH)	200 mm x 150 mm x 60 mm
Weight	1.65 kg

## FILTER BOX F-BOX 3-100

F-BOX 3 Application	Lowpass filter for smoothing the dc voltage for very low ripple application < 500 mV
Standard	MIL-HDBK-704-7 HDC 103 MIL-HDBK-704-8 LDC 103 other applications with low ripple signals
Application MIL-HDBK	Test condition A (10 Hz) Test condition B (25 Hz)
Voltage	AC: 230 V DC: 500 V
Current	100 A
Frequency	max. 60 Hz
Dimension (LxWxH)	255 mm x 180 mm x 80 mm
Weight	3.25 kG

## ACCESSORIES

## FILTER BOX L-BOX 1-32A

Application	50 µH decoupling coils with integrated 10 µF capacitor for MIL-STD-704 LDC
Max EUT Voltage	500 VDC / 360 VAC
Max EUT current	32 A

## FILTER BOX L-BOX 1-100A

Application	50 µH decoupling coils with integrated 10 µF capacitor for MIL-STD-704 LDC
Max EUT Voltage	500 VDC / 360 VAC
Max EUT current	100 A

## TECHNICAL DETAILS

## OTHER SOLUTIONS &amp; OPTIONS

## OTHER MODELS

NetWave Series (1-phase)	Single phase Multifunction AC/DC Power sources, up to 7,500 VA AC and 9,000 W DC
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## EQUIPMENT FOR HARMONICS AND FLICKER

DPA 503N	3-phase Harmonics and Flicker analyzer
AIF 503N16	3-phase flicker impedance, 3x400 V, 16 A 0.24ohm + j0.15ohm (Lines) 0.16ohm + j0.10ohm (Neutral)
AIF 503N16.1	3-phase flicker impedance, 3x400 V, 16 A 0.24ohm + j0.15ohm (Lines) 0.16ohm + j0.10ohm (Neutral) Rackmounted inside a MRAC 25

## FLICKER IMPEDANCES WITH ZREF AND ZTEST

General	3-phase dual-impedance, Zref: 0.24 ohm + j0.15 ohm (Lines) 0.16 ohm + j0.10 ohm (Neutral) Ztest: 0.15 ohm + j0.15 ohm (Lines) 0.10 ohm + j0.10 ohm (Neutral)
AIF 503N32.1	3x400 V, 32 A
AIF 503N63.1	3x400 V, 63 A
AIF 503N75.1	3x400 V, 75 A

## AUTOMOTIVE OPTIONS

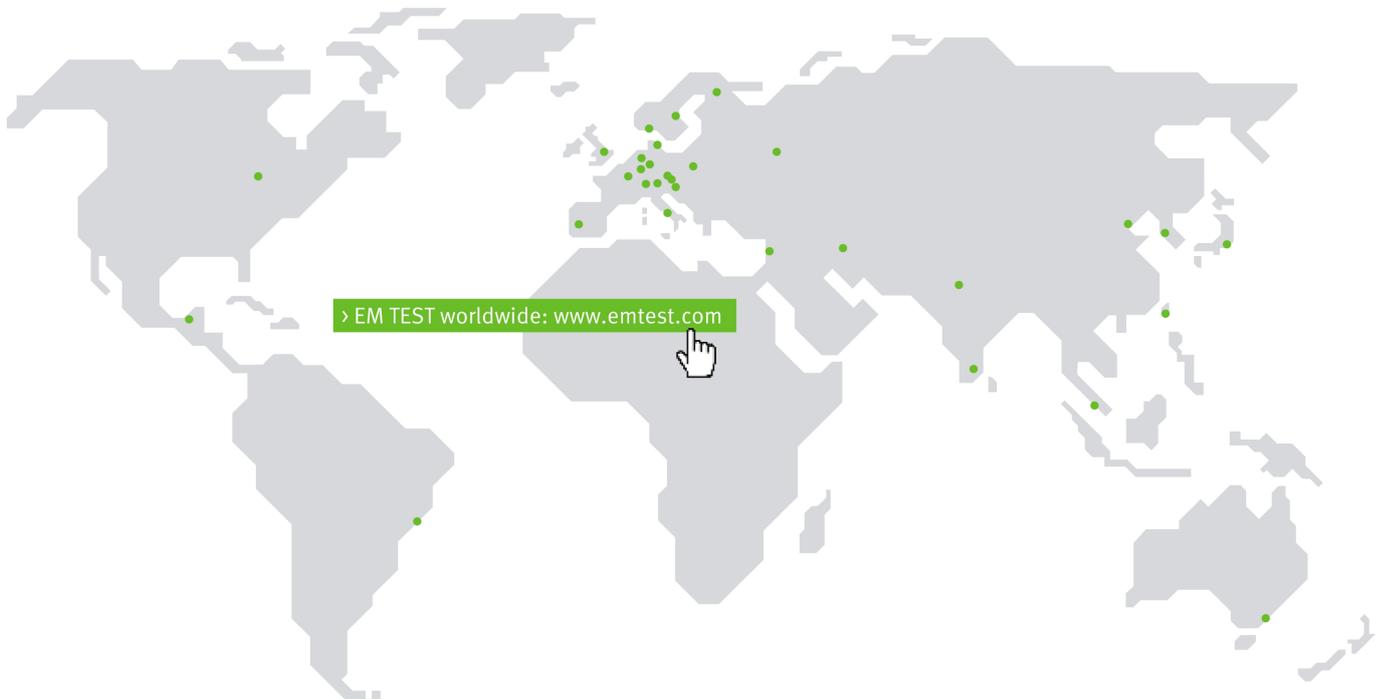
## AUDIO AMPLIFIERS

AMP 200N1.1	LF Signalgenerator & Amplifier, DC to 250 kHz, (500 kHz), 800 W, Output voltage max. 140 Vp-p, 50 Vrms
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## COUPLING TRANSFORMERS

	Coupling transformer to couple sinusoidal disturbances to AC and DC lines
CN 200N1	frequency 10 Hz to 250 kHz, sec. current up to 50 A, sec. voltage 400 VAC/600 VDC
CN 200N100	frequency 50 Hz to 500 kHz, sec. current up to 100 A, sec. voltage 1400 VAC/2000 VDC
CN 200N200	frequency 100 Hz to 450 kHz, sec. current up to 200 A, sec. voltage 800 VAC/1200 VDC
CN 200N300	frequency 100 Hz to 450 kHz, sec. current up to 300 A, sec. voltage 800 VAC/1200 VDC

# COMPETENCE WHEREVER YOU ARE



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Information about scope of delivery, visual design and technical data correspond with the state of development at time of release. Subject to change without further notice.