Manual For Operation



NetWave

NetWave 3.1, 5, 7, 7.1, 20, 30, 60, 67 NetWave 7.2, 20.1, 30.1, 30.4, 60.1, 67.1 NetWave 7.3, 20.2, 30.2, 60.2, 67.2, 90.2 NetWave 20.3, 30.3, 60.3, 67.3, 90.3, 108.3 NetWave 20.5, 30.5, 67.5, 90.5, 108.5 NetWave 90.3MS

Simulation of the most required power supply phenomena's

FW Version >7.00.00

The NetWave is a single and three phase AC power source, specifically designed to meet the requirements as per IEC/EN 61000-4-8, 13, -14, -17, -27, -28. It is also serving as a DC power source to cover the requirements as per IEC/EN 61000-4-29 for voltage dips and interruptions on DC supplies as well as tests for electrical vehicles.

Its output power with low distortion and high stability, even if supplying dynamic loads, guarantees full compliant measurements for harmonics and flicker testing as per IEC/EN 61000-3-2, JIS C 61000-3-2 and IEC/EN 61000-3-3 as well as per IEC/EN 61000-3-11 and IEC/EN 61000-3-12. Additionally, the NetWave is also well suited for avionics testing as per DO-160, MIL-STD-704, Airbus ABD0100 and Boeing and testing of electrical vehicle standards i.e. LV 123 and VW 80300.

- IEC 61000-3-2
- IEC 61000-3-3
- IEC 61000-3-11
- IEC 61000-3-12
- IEC 61000-4-8
- IEC 61000-4-13
- IEC 61000-4-14
- IEC 61000-4-17
 IEC 61000-4-27
 - IEC 61000-4-27
 - IEC 61000-4-28
- IEC 61000-4-29
 - JIS C 61000-3-2 MIL-STD-704
- RTCA/DO 160
- Airbus
- Boeing

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VW 80300

the benchmark for emc



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	Specifications subject to change
Foreword	Thank you for purchasing the NetWave generator. This user's manual lists precautions that must be taken during use and contains useful information about the functions and operating procedure of the device. To ensure correct use, please read this manual thoroughly before starting operation. After reading the manual, keep it in a convenient location for quick reference whenever a question arises during operation.
	diagram. For information about using and handling with the software NetWave Control, see the manual for this product
Notes	The content of this manual is subject to change without prior notice because of continuing improvements to the instrument's performance and functions. The figures given in this manual may differ from those that appear on your display and screen.
	Every effort has been made in the preparation of this manual to ensure the accuracy of these contents. Should you have any questions or find any errors, please contact your EM Test representative or send an email to EM Test.
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	Other company and product names are trademarks or registered trademarks of their respective companies
	For purpose of this manual, the TM and $\ensuremath{\mathbb{R}}$ symbols do not accompany their respective names or registered trademark names.
Version	This manual is written for NetWave Firmware version 7.00.00 and higher

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1. Safety

1.1. Safety Aspects

Observe all precautions to assure your personal safety. The generators comply with Installation Category II (excess voltage section).

Pay special attention to safety and operation details!

1.2. Safety and warning label on the device

Please take note of the following explanations of the symbols used in order to achieve the optimum benefit from this manual and to ensure safety during operation of the equipment.

4	This symbol warns of a potential risk of shock hazard. The symbol on an instrument shows that that it can source 1000 volt or more, including the combined effect of normal and common mode voltages. Use standard safety precautions to avoid personal contact with these voltages.
	This symbol indicates where a caution is required. Refer to the operating instructions located in the manual in order to protect against personal injury or damage the equipment.
٠ŀ	GROUND Indicates protective Ground Terminal
*CAUTION"	The "CAUTION" symbol indicates a potential hazard. It calls attention to a procedure, practice or condition which, if not followed, could possibly cause damage to equipment. Such damage may invalidate the warranty. If a "CAUTION" is indicated, do not proceed until its conditions are fully understood and met.
"WARNING"	The "WARNING" symbol indicates a potential hazard. It calls attention to a procedure, practice or condition which, if not followed, could possibly cause bodily injured or death. If a "WARNING" is indicated, do not proceed until its conditions are fully understood and met.

Power Supply

If not stated otherwise, the equipment is intended to operate with a power supply not to exceed 250 volts between phase and neutral or between phase and ground. A proper ground connection through the ground connector of the power cord is essential for safe operation.

Grounding the Generators

The generators are grounded through the power cord. To avoid electric shock, plug the power cord into a properly installed receptacle which was tested by a qualified electrician. Have the test performed before connecting equipment.

Without the protective ground connection, all parts of the generators are potential electric shock hazards. This may include components which appear to be insulated. The equipment **MUST NOT BE USED** if this protection is altered.

Use the Proper Power Cord

Use only power cords and connector specified for your product. Use only power cords in good condition.

Use Proper Fuses

To avoid fire hazard, use only fuses as specified in the parts listing for your product - matching type, voltage and current rating.

Do Not Remove Covers or Panels

To avoid personal injury, do not operate the generators without panels and covers.

Do Not Operate in an Explosive Environment

Electric Overload

Never apply power to a connector which is not specified for that particular voltage/current.

1.3. Responsibility of the operator

These operating instructions form an essential part of the equipment and must be available to the operator at all times. The user must obey all safety instructions and warnings.

The purpose of this instrument is the generation of defined interferences signals for EMI immunity testing. Depending on the arrangement of the test rig, the configuration, the cabling and the properties of the EUT itself, a significant amount of electromagnetic radiation may result that could also affect other equipment and systems.

The equipment is designed to operate in industrial environment. For operating in other or sensitive environment, such as light industry, airport area..., the user may use a shielded room for operate.

The user himself or herself is ultimately responsible for the correct and controlled operation of the rig. In case of doubt, the tests should be carried out in a Faraday cage.

1.4. General hazard

Before applying power to the system, verify that your product is configured properly for your application.



WARNING

The generators and their accessories operate at high voltages.

Hazardous voltages may be present when covers are removed. Qualified personnel must use extreme caution when servicing this equipment.

Circuit boards, test points, and output voltages also may be floating above (below) chassis ground.

The design of external insulation must be such that it exceeds the maximum voltages of the device.



WARNING

Risk of electrical shock by touching the output plugs

For reduce the output voltage to low values it is necessary to set the voltage to zero volt.

The output voltage might be present on DPA 500N / 503N or AIF output plugs after closing the software. The source output must be switched off.

Only *qualified personnel* who deal with attendant hazards in impulse generators, are allowed to perform installation and servicing.

Ensure that the AC power line ground is connected properly to the Power Rack input connector or chassis. Similarly, other power ground lines including those to application and maintenance equipment *must* be grounded properly for both personnel and equipment safety.

Always ensure that facility AC input power is de-energized prior to connecting or disconnecting any cable.

The user must ensure that the output power lines are labeled properly as to the safety hazards and that any inadvertent contact with hazardous voltages is eliminated.

Guard against risks of electrical shock during open cover checks by not touching any portion of the electrical circuits. Even when power is off, capacitors may retain an electrical charge. Use safety glasses during open cover checks to avoid personal injury by any sudden component failure.

Neither AMETEK CTS GmbH, nor any of the subsidiary sales organizations can accept any responsibility for personnel, material or inconsequential injury, loss or damage that results from improper use of the equipment and accessories.



Personnel fitted with a heart pacemaker must neither operate the instrument nor approach the test setup while a test is being executed.

Only approved accessories, connectors, adapters, etc. are to be used to ensure safe operation.

1.5. Qualification of personnel

WARNING

The generator must be operated only by authorized and trained specialists with detailed knowledge of the international, national or manufacturer's test standard.

2. Model Overview

2.1. NetWave single phase models and extension modules

	3.1	7	7.3
Number of Lines	1	1	1
Output Voltage AC (V) (p-n)	310	300	360
Output Voltage DC (V)	440	425	500
Output Power AC (kVA)	3	7.5	7.5
Output Power DC (kW)	4.25	9	9
Output Current continuous (A) ¹⁾	10	26	26
Output Current short term (max. 3s) (A) 1)	20	47	47
Output Current repetitive peak (A) ¹⁾	70	200	200
Bandwidth (kHz)	5	5	5
Isolated Output			•

Options

Opt-1 NWB	 Measure extension board with 2 measuring input channels for voltage and current (internal measurements)
IT-NetWave Isolating transformer	 Extension for potential free output. This option allows connecting any output lead (positive or negative) to GND. This isolation transformer is mandatory for testing according to Military and Aircraft standards. Three-phase isolation transformer for NetWave, input voltage 3x200 V or 3x400 V, output voltage 3x400 V, with 25HU rack. Only used to upgrade existing NetWave originally delivered without this option.

2.2. NetWave 3-phase Models

Basic models with new extended functions as follow: Source AC, Simple AC & External Mode (refer to Annex 9.2 for detailed information):

- NetWave 20
- NetWave 30
- NetWave 60 (model replaced 2017, by NetWave 67)
- NetWave 67

Models with AC voltage range up to 360 Vac / ±500 Vdc for Aircraft application:

- NetWave 20.1 (model replaced 2012, by NetWave 20.2)
- NetWave 30.1 (model replaced 2012, by NetWave 30.2)
- NetWave 60.1 (model replaced 2012, by NetWave 60.2)

Models with AC voltage range up to 360 Vac / \pm 500 Vdc with new extended functions as follow: Source AC, Simple AC & External Mode (refer to Annex 9.2 for detailed information):

- NetWave 20.2
- NetWave 30.2
- NetWave 60.2 (model replaced 2017, by NetWave 67.2)
- NetWave 67.2
- NetWave 90.2

Models with AC voltage range up to 400 Vac / \pm 560 Vdc with new extended functions as follow: Source AC, Simple AC & External Mode (refer to Annex 9.2 for detailed information):

- NetWave 20.3
- NetWave 30.3
- NetWave 60.3 (model replaced 2017, by NetWave 67.3)
- NetWave 67.3
- NetWave 90.3
- NetWave 108.3

Models with AC voltage range up to 400 Vac / \pm 560 Vdc, based on the .3 models and added isolation voltage range of 700Vac / 1000Vdc:

- NetWave 20.5
- NetWave 30.5
- NetWave 67.5
- NetWave 90.5
- NetWave 108.5

Special models with limited output voltage

- NetWave 30.4, based on 30.3 but output voltage limited to 354 Vac / ±500 Vdc

Module	includes							
Power source	- AC /DC power source							
	 Frequency DC – 5 kHz 							
	- AC output power : 22.5 kVA 30 kVA 67 kVA 90 kVA							
	- DC output power : 20 kW 36 kW 72 kW 110 kW							
WaveGenerator	- On-Board supply simulator							
	- net.control software to generate wave shapes based on segments, point to point matrix.							
	- Controller with internal hard disk.							
Isolating transformer	 Included for potential free output. Allows connecting any output lead (positive or negative) to GND. This is necessary for testing according to Military and Aircraft standards 							
Options								
Opt-3 Recovery	 Recovery module for power feed into the mains up to 100% of the rated AC and DC power 							
Opt-3 Parallel	- Parallel mode will connect all three internal sources together in parallel for higher current.							
Opt-3 NWB	Built-in measuring channels (6 Channels) for voltage and current (remote controlled per USB interface)current (internal measurements)							
	For NetWave 60.x and 90.x in Parallel Mode the measuring channels are not supported.							
Opt-3 DC-EVR	 DC extended voltage range. Double DC voltage range, using two phases simultaneously 							
Opt-3 MS	 Put 3 single NetWaves in multi-source configuration (parallel configuration) to get one 3phase NetWave with enhanced combined power. 							
Opt-3 CS	- Put 2 single NetWaves in cascade source configuration (series connection) to get one 1phase NetWave with enhanced combined power and double voltage.							

	20	20.2	20.3 /.5	30	30.2	30.3 /.5	67	67.2	67.3 /.5	90.2	90.3 /.5	108.3 /.5
AC Voltage (L-N)	300	360	400	300	360	400	300	360	400	360	400	400
AC Voltage (p-p)	520	620	690	520	620	690	520	620	690	620	690	690
DC Voltage	425	500	560	425	500	560	425	500	560	500	560	560
Opt-3 Recovery	opt.	opt.	 Image: A second s	opt.	opt.	 Image: A second s	opt.	opt.	√	opt.	 Image: A second s	 Image: A second s
Opt-3 Parallel	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.
Opt-3 NWB	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.
Opt-3 DC-EVR	opt.	opt.	 Image: A second s	opt.	opt.	 Image: A second s	opt.	opt.	√	opt.	1	 Image: A second s
Opt-3 MS	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.
Opt-3 CS	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.
Lic-3 NetIndustry	\checkmark	\checkmark	 Image: A second s	1	\checkmark	 Image: A second s	 Image: A second s	1	\checkmark	 Image: A second s	 Image: A second s	 Image: A second s
Lic-3 NetHarmonics	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.
Lic-3 NetMilitary	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.
Lic-3 NetAircraft DO	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.
Lic-3 NetAircraft Airbus	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.
Lic-3 NetAircraft Boeing	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.
Lic-3 NetAutomotive	opt.	opt.	 Image: A second s	opt.	opt.	 Image: A second s	opt.	opt.	\checkmark	opt.	1	 Image: A second s







NetWave 20.x / 30.x with recovery

NetWave 60.x

NetWave 90.x with recovery

3. Delivery groups and put in service

Identical accessory parts are delivered only once if several devices are ordered. The delivered packing list is in each case valid for the delivery.

3.1. Basic equipment NetWave 3 / 5 / 7

- Power source NetWave 3 / 5 / 7
- CEE connector 32A (NetWave 7)
- Mono phase connector Type 223 (NetWave 3 / 5)
- ESA1 EUT Adapter country coded
- 0.5m banana cable for sense (2*black, 2* blue, 1* yellow-green)
- Fuse: 1 Set of spare fuses 2* 1 A, 2* 3.15 A, 2* 25 A
- Connectors 1 Set of banana connectors 2* black, 2* blue
- Calibration certificate
- Manual on USB memory stick
- Software with license

3.2. Scope of supply NetWave 7.x

- Power source NetWave 7.1 / 7.2 / 7.3
- Rack complete with wheels and mains power switch
- IT-NetWave built in insulating transformer with filter input (3*208 V or 3*400 V)
- CEE connector 32 A
- ESA1 EUT Adapter country coded
- 0.5 m banana cable for sense (2* black, 2* blue, 1* yellow-green)
- Fuse: 1 Set of spare fuses 2* 1 A, 2* 3.15 A, 2* 25 A
- Connectors 1 Set of banana connectors 2* black, 2* blue
- Emergency switch with red button
- Manual on USB memory stick

3.3. Scope of supply NetWave 20.x / 30.x / 60.x / 67.x / 90.x / 108.x

- Power source NetWave
- 3-phase EUT Out connector male 32 A (NetWave 20.x & 30.x only)
- Connector set EUT Out :100 A connectors (Multicontact)
- Emergency switch with red button
- Interlock terminator and interlock connector (only for .5 models)
- Sense cable with MIL connectors male-female
- Fuse NetWave 20.x/30.x: 1 Set of spare fuses 2* 1 A, 2* 2.5 A, 2* 80 A
- Fuse NetWave 60.x: 1 Set of spare fuses 2* (160 A,50 A, 5 A, 4 A, 3.15 A, 205 A,1 A)
- Fuse NetWave 90.x: 1 Set of spare fuses 2* (250 A, 80 A, 6.3 A, 6 A, 2.5 A, 1 A)
- Calibration certificate
- Manual on USB memory stick

3.4. Scope of supply Opt-3 MultiSource

- Emergency switch with red button and 3 connectors
- 3 Framebus terminators
- Control cable Framebus, 4m
- Control cable Framebus, 8m
- 2 Signal cable BNC, 4m
- Calibration certificate
- Connection Box MS

3.5. Scope of supply Opt-3 CascadeSource

- Emergency switch with red button and 2 connectors
- 2 Framebus terminators
- Control cable Framebus, 4m
- Signal cable BNC, 4m, BNC T-adapter
- Calibration certificate
- Connection Box CS

3.6. Put in service

3.6.1.Unpacking

Inspect the unit for any possible shipping damage immediately upon receipt. If damage is evident, notify the carrier. DO NOT return an instrument to the factory without prior approval. Do not destroy the packing container until the unit has been inspected for damage in shipment.

If there is an external damage, make information to your representative.

For open the wooden box user needs the following tools

Lifter:	Forklift, or crane with suitable capacity
Screw driver:	Torx size T15 or T20
Other useful items:	Pinch bar, hammer, crane ropes

Open the wooden box:

The box has one side that is closed with screws. All other sides are fixed with nails.

- 1. Unlock all torx screws on the front side. The screws are on top, bottom, left and right side of the front.
- **2.** Remove the front side for open the box.
- **3.** If necessary, unlock the screws on top and remove the top cover.



3.6.2. Final position

Please check the maximum floor loading of the position where the NetWave is places and compare with the weight in kg/m2.

NetWave :	Weight	Area	Floor loading		
		device	approx.		
20.x	740 kg	0.59 m ²	1260 kg/m ²		
30.x	740 kg	0.59 m ²	1260 kg/m ²		
60.x, 67.x	1180 kg	0.96 m ²	1230 kg/m ²		
90.x	1700 kg	1.45 m ²	1175 kg/m ²		
108.x	1700 kg	1.45 m ²	1175 kg/m ²		
20.x with recovery	810 kg	0.76 m ²	1070 kg/m ²		
30.x with recovery	810 kg	0.76 m ²	1070 kg/m ²		
60.x, 67.x with recovery	1380 kg	1.29 m ²	1070 kg/m ²		
90.x with recovery	2000 kg	1.93 m ²	1070 kg/m2		
108.x with recovery	2000 kg	1.93 m ²	1070 kg/m2		

3.6.3.Dimensions

NetWave 20.x / 30.x		with recovery
Height (rolls+crane support)	1560 (1784)	1560 (1784)
Width	930	1210
Depth	755	755
NetWave 60.x, 67.x		with recovery
Height (rolls+crane support)	1800 (2080)	1800 (2080)
Width	1205	1615
Depth	970	970
NetWave 90.x, 108.x		with recovery
Height (crane support)	1800 (1880)	1800 (1880)
Width	1810	2410
Depth	970	970

Note: For detailed dimensional data please refer to chapter "Technical data".

3.6.4. Mechanical Installation

The NetWave is a completely self-contained power source. It may be used free standing on a bench top or rack mounted with trolley. The unit is fan cooled, drawing air in from the front and exhausting at the rear. At the rear side at least 0.5 m clearance must be maintained. More space will be needed when the operator need recently to change connectors.

Airflow The figure shows the general airflow on a NetWave 60 model. BLUE: Cold air enters the NetWave RED: Hot air exhaust Front Rear Standard with recovery

3.6.5. Power requirements

Do not connect other mains voltages than specified (400 V-480 V). Other voltages could damage the unit.



A circuit breaker with appropriate rated current and type C characteristics must be used.

The residual current device RCD must be type B if one is installed at the input.

Model	Power Requirements	Nominal current	Inrush curent	Input connector
Netwave 3.1	1 x 230V ±10% 1PH + PE	25A	50A	Mennekes 817 or equivalent
Netwave 7	3x400V ±10% 3PH +N +PE	18A phase 30 Neutral	32A phse 54A Neutral	Mennekes 1409 or equivalent
Netwave 7.3 400	3x400V ±10% 3PH +N +PE	25A phase	50A phase	Mennekes 1409 or equivalent
Netwave 7.3 208	3x208V ±10% 3PH +N +PE	50A phase	100A phase	Phoenix HDFKV 25
Netwave 20.X 400	3x400V ±10% 3PH+PE	50A phase	90A phase	Phoenix HDFKV 50
Netwave 20.X 480	3x480V ±10% 3PH+PE	42A phase	75A phase	Phoenix HDFKV 50
Netwave 20.X 208	3x208V ±10% 3PH +PE	100A phase	180A phase	Phoenix HDFKV 50
Netwave 30.X 400	3x400V ±10% 3PH+PE	70A phase	140A phase	Phoenix HDFKV 50
Netwave 30.X 480	3x480V ±10% 3PH+PE	60A phase	120A phase	Phoenix HDFKV 50

NetWave

Model	Power Requirements	Nominal current	Inrush curent	Input connector	
Netwave 67.X 400	3x400V ±10% 3PH+PE	160A phase	212A phase	Phoenix HDFKV 95	
Netwave 67.X 480	3x480V ±10% 3PH+PE	134A phase	176A phase	Phoenix HDFKV 95	
Netwave 90.X 400	3x400V ±10% 3PH+PE	210A phase	318Aphase	Phoenix HDFKV 95	
Netwave 90.X 480	3x480V ±10% 3PH+PE	175A phase	265A phase	Phoenix HDFKV 95	
Netwave 108.X 400	3x400V ±10% 3PH+PE	252A phase	381A phase	Phoenix HDFKV 95	
Netwave 108.X 480	3x480V ±10% 3PH+PE	210A phase	318Aphase	Phoenix HDFKV 95	

3.6.6.Galvanic insulation

The galvanic insulation between the power input and power output is depend the NetWave model different.

No galvanic insulation:	NetWave for IEC and Harmonic Flicker application			
	Model: 1-phase: 3-phase:	NetWave 3, NetWave 5, NetWave 7, none		
With galvanic insulation:	NetWave for Aircraft and Military application NetWave with the optional IT insulating transformer			
	Model: 1-phase: 3-phase:	NetWave 7.1, NetWave 7.2, NetWave 7.3 All models		

3.6.7.Input Wiring

The input CEE type plug or Screw terminal is located at the rear of the unit. The mains source must have a current rating equal to or greater than the input circuit breaker / fuses and the input wiring must be sized to satisfy the applicable electrical codes.

Step 1: Power supply (mains)

Remove the cover for mains input (1) and connect the mains line to the mains input connectors.

Step 2: EUT power supply

Connect the EUT to the EUT output on:

- Safety lab connectors or
- Disconnect the cover (2) and fix the power cable.



Connectors for mains supply

NetWave 3

Type 223 1-phase



NetWave 7.x

CEE Type 32 A

Screw terminals

NetWave 7.3-208

3- phase NetWave models MAIN SUPPLY A

L1 L2 L3 PE

Screw terminal



Screw terminal 50 A

Minimum cable cross section (proposed)

For exact dimension refer to the cable manufacturer datasheet

Nominal current	Cable cross section				
А	(Group 2)	(Group 1)			
	Flexible mm ²	Fixed (one or multiple) mm ²			
32	6	10			
63	16	25			
125	50	70			
160	70	95			
200	95	120			
250	120	an			



Capacitors in the power source may hold a hazardous electrical charge even if the power source has been disconnected from the mains supply. Allow capacitors to discharge to a safe voltage before touching exposed pins of mains supply connectors.

Caution

3.6.8. Output Wiring

The output Plugs, are located at the front and rear of the unit. The external sense inputs allow the power system output voltages to be monitored directly at the load and must be connected either at the load when the sense is programmed for external.

The external sense input does not have to be connected when Internal Sense is programmed. The external sense wires are to be connected to the SENSE input on the rear panel and should be run as a twisted pair for short lengths. Sense leads over one meter long should be run as a twisted shielded pair.



The output of the NetWave is not isolated from the input line. (NW 3 / 5 / 7)

Floating operation from the input needs an **optional insulating transformer**. This option allows if either side (HIGH or LOW) needed, may be grounded.

3.6.9. Control cable wiring

1. Signal control cable

Make sure that the bridges for L1, L2, L3



SIGNAL OUT to SOURCE IN

are connected.

2. Computer – NetWave control cable

There are two solutions to connect the computer to the NetWave.

- Ethernet connection
- IEEE connection

Connection to

Standalone equipment - Ethernet - USB via USB-Ethernet adapter (direct cable)

Rack with other equipment - IEEE 488 / GPIB







Ethernet cables

Check the correct cable wiring when using ethernet cables.

- Direct - USB-Ethernet Adapter

=> normal straight cable => direct cable

3.6.10. NetWave 3 and NetWave 5 system cabling



Cabling NetWave 3/5.

The insulating transformer IT-NetWave is optional for testing Aircraft and Military standards.

3.6.11. NetWave 7 system cabling



NetWave 7 with optional insulating transformer for testing Aircraft and Military standards.

3.6.12. NetWave 7.x system cabling



Cabling NetWave 7.x with internal insulating transformer and optional DPA 500N

3.6.13. NetWave 7.x with DPA and AT1-NetWaveStep-Up transformer

The AT1- NetWave Step-Up transformer will expand the voltage from 300 V to 400.

Therefore, it is necessary to enter the transformer ratio 1.333 in the device setup of the NetWave



Cabling NetWave 7.x with AT1- NetWave Step-Up transformer and optional DPA 500N

3.6.14. NetWave 3-phase 20.x / 30.x / 60.x / 67.x / 90.x / 108.x system cabling



Cabling NetWave 20.x / 30.x / 60.x / 67.x / 90.x / 108.x

3.6.15. Power cable wiring for Harmonic and Flicker Application

1-phase system



Example for the cabling with using the DPA 500N Harmonic and Flicker analyzer.

3-phase system



Example for the cabling with using DPA 503 Harmonic and Flicker analyzer.

3.6.16. Power cable wiring for Aircraft and MIL application

1-phase system



3-phase system



For DC application the + pole can be connected between one line L1, L2 or L3 and Neutral N

3.6.17. Cable wiring NetWave with AMP200N



Cabling of NetWave and AMP200Nx

3.6.18. Cable wiring NetWave with PFS 503Nxxx.2



Cabling of NetWave and PFS 503Nxxx.2 for testing 3-phase dips and interruptions as per IEC 61000-4-11 and IEC 61000-4-34.

Voltage dips and interruptions application with a NetWave operates according the following principle.

100 % voltage: From the mains of the building

Reduced dip voltage: From the NetWave 3-phase AC source

For dips the power source changes from mains (100%) to the NetWave AC source (reduced voltage)



The test is performed by iec.control software. For more application information refer to the PFS 503 manual.

3.6.19. Cable wiring NetWave with Rack incl. integrated AIF 503N16.1, DPA 503N and PFS 503N32.2



Interconnections

NetWave	Rack	Cable	
Emergency Switch connector	Safety Circuit – SLAVE connector	Interconnect cable with Hirschmann connectors	The emergency switches of the NetWave and the Rack are linked through the Slave connection.
TRIGGER IN 2	SYNC OUT	BNC Cable	The NetWave is synchronized to the mains of the PFS 503N32.2
Power OUT	EUT Input / PF2	Appropriate power cables	The power output of the NetWave provides the input voltage to the rack. It is used for harmonics & flicker tests as mains voltage. As well as PF2 input to the PFS 503N32.2 for voltage dips.
SENSE	SENSE		In addition, the sense input of the NetWave can be connected to the rack to compensate for the voltage drop in the power cables

3.6.20. Limitations when used for Surge testing

The following limitations apply when the NetWave is used as AC source during Surge testing according IEC 61000-4-5:



3.6.21. Functional test

- 1. Connect an oscilloscope, voltmeter and/or power analyzer to the AC source output at the output terminal.
- With the AC mains verified as being off, apply the correct three phase AC power input voltage connections to the AC source connector. Apply the AC mains power and turn on the main circuit breaker on the AC source front panel.
- 3. Verify the front panel LCD display lights up with the initial startup screen showing the device name and the firmware version.
- 4. Press "SETUP / Power Source" and set the unit to 230 V / 50 Hz, current limit to max. (50 A for NetWave 7/20).
- 5. Enable the output by pressing the "TEST ON" button below the front panel display screen. The button will light yellow when the output is on. The output should be a clean 230 V AC Sinewave having less than 0.5% distortion.
- 6. Apply full load to the output of the source and verify the output remains within 1% of the initial 230 V value. The output should still be clean, and the distortion should still be less than 0.5% at 50 Hz.
- 7. Using the menu SETUP / Power source set the output current limit value to 15 A. The system should go into current limit. Return the current value to maximum value (50 A, 67 A, 100 A) and press the "TEST ON" button to turn the output off. Disconnect the load.

In the unlikely event the power source does not pass the functional test, contact your EM Test representative



Setup for functional test with load 230 V / 26 A

4. **Functions**

4.1. Front view controller



TRIG



The LED Trigger indicates - Manual, external or remote trigger event

- Start of a sequence

measuring status

2. LED Running



3. LED power



The LED power indicates the power on status.

The LED Running indicates the running play- or

4. Test ON TEST ON	Pressing thi - TEST ON - TEST OFF	s button will enable the output voltage => LED is on => LED is off			
5. Mode MODE	Pressing this button will cyclic rotate the main menus. - Wave Generator - Measurement U / I - Wave Manager				
6. Start 7. Stop START STOP	Start and Stop button for measuring and running arbitrary waves. START: Starts or continue. STOP: Stops a measuring or a running arbitrary				
	2 nd STOP :	waves. Exit of the play or setup change function			
8. Cursor key "←" "→"	Cursor Key - Scrolling ir - Setting the				
9. Setup SETUP	Menu buttor	n for the device configuration menu.	See Chapter Setup Menu		
10. LED output active channel L1 to OUTPUT ACTIVE	LED display Depends of	for indicate the active output channels. extension 1 or 3 phase's model.			
© 12 © 13	L1: L1, L2, L3:	Single phase model. 3-phase model. Any other combinations are possible with the 3-phase model			
11. Test supply output TEST SUPPLY	The test sup side and in	oply output to the EUT is located at the front parallel at the rear side.			
LowPE	Output Volta AC up t DC up t	age: o 300 Vrms o ± 425 V			
12. Display NetWave 7 230V/50Hz Version 5.00	LCD display	2 x 40 characters			

4.2. 1-ph systems

4.2.1.Rear view NetWave 3 / 3.1 / 5 / 7 / 7.1 / 7.2

The upper part of the NetWave is the control part. The control plugs are at the rear side of the NetWave available.



1. Ventilator

2. Framebus IN / OUT



Ventilator for the controller Part

Framebus connectors. Sub D 15 poles male and female

This port is used as communication and control bus between EM Test devices.

Framebus terminating

In general, the framebus is terminated with a 120 Ω terminating resistor between Pin 1 and Pin 9. The frame bus termination can be orders under ERP Number 101732

3. Serial from DPA port

SERIAL FROM DPA



Pin assignment

Serial connection to the DPA power analyzer.

Only legacy support of old DPAs, the port is no longer used.

(RS 232 port, 9 pole Sub D male connector)

NetWave	Signal	Signal	DPA
9- Pol SubD m	_	_	9- Pol SubD f
1	CD		7
2	TxD	 RxD	3
3	RxD	 TxD	2
4	DTR		6 / 8
5	GND	 GND	5
6	DSR		4
7	RTS		1
8	CTS		4
9	RI		9
	screen	screen	

- **1** Ventilator controller part
- 2 Framebus IN / OUT
- 3 Serial from DPA 500N / 503
- 4 Trigger IN1 / IN2
- 5 Trigger OUT1 / OUT2
- 6 Ethernet port
- 7 USB port
- 8 DUT monitor
- 9 GPIB / IEEE 488 port
- 10 Heat Sink air output
- **11** Ventilator (output)
- 12 Safety circuit
- 13 Fuse 3.15 A slow blow (ctrl)
- 14 Mains in CEE 32 A 3x400 V
- 15 Sense input
- 16 Test supply output



- Ventilator controller part 1
- Framebus IN / OUT 2
- 3 Serial from DPA 500N / 503

NetWave

- 4 Trigger IN1 / IN2
- 5 Trigger OUT1 / OUT2
- 6 Ethernet port
- 7 USB port
- 8 DUT monitor
- 9 GPIB / IEEE 488 port
- 10 Heat Sink air output
- Ventilator (output) 11
- 12 Safety circuit
- Fuse 3.15 A slow blow (ctrl) 13
- Mains in CEE 32 A 3x400 V 14
- 15 Sense input

Remarks

Test supply output 16

4. Trigger IN



5. Trigger OUT

6. Ethernet port ETHERNET

7. USB port





100 mA Current : NOTE : For use the trigger out the user must connect an external DC source for pull up the trigger signal. If no external dc source is available, a T-connection to Trigger IN will deliver the dc

Trigger input for event triggering. This trigger inputs

are connected directly to the DSP signal processor.

Function

Wave start

Wave stop

Trigger output for event triggering. This trigger

24 V (pull up)

outputs are generated from the DSP signal

Input Signal : Negative slope

Input

Trigger IN 1 :

Trigger IN 2 :

processor. Max. voltage:

signal.



Pin assignment 1: TXD+ 2: TXD 3: RXD+ 4: RXD-

USB port for data transfer to or from a memory stick.

The network controller supports a 10 / 100Base-

10 Mbit/sec or 100 Mbit/sec connection.

Tinterface. The device auto-negotiates the use of a

2: +DATA

The power contacts for USB devices are not protected. They are suitable to supply connected USB devices with a maximum of **500** mA power dissipation. Don't supply external USB devices with 4: VCC higher power dissipation through this interface.







8. DUT monitor



DUT monitor for any fail detection.

DUT Monitor 1: DUT Monitor 2:

Function:

Input signal: Negative slope.

NOTE: The signal must be released to high before you start the next wave. The test will start and does not stop if the monitor signal is at low level during the wave start

Settings

The DUT monitor is settable in the NetWave software and has the following function **Disabled** no function

Stopstops immediately the waveNotifysend a message to DUT Log file

9. GPIB / IEEE 488 port



10. Heat Sink air output

Parallel interface GPIB / IEEE 488, IEEE 488 interface with IEEE connector.

The unit is fan cooled, drawing air from the front and exhausting at the rear. At the rear side at least 0.2 m clearance must be maintained. This air output is for cooling the power solid state switches

11. Ventilator

The unit is fan cooled, drawing air from the front and exhausting at the rear. At the rear side at least 0.2 m clearance must be maintained. This fan outputs are for cooling the power part of the NetWave

12. Safety Circuit

Short circuit for interrupt the output voltage immediately, when open the safety circuit. Open circuit voltage: 32 V AC / 50 Hz

- 1 Ventilator controller part
- 2 Framebus IN / OUT
- 3 Serial from DPA 500N / 503
- 4 Trigger IN1 / IN2
- 5 Trigger OUT1 / OUT2
- 6 Ethernet port
- 7 USB port
- 8 DUT monitor
- 9 GPIB / IEEE 488 port
- 10 Heat Sink air output
- 11 Ventilator (output)
- 12 Safety circuit
- 13 Fuse 3.15 A slow blow (ctrl)
- 14 Mains in CEE 32 A 3x400 V
- **15** Sense input
- **16** Test supply output







13. Fuse



Fuse for control unitFuse type :3.15 A slow blowDimension :5 x 20 mm

14. Mains input CEE 32 A connector



Power input connector CEE Type 32 A 5 pole 3 x 400 V

programmed for external.



15. Sense input





16. Test Supply output



The NetWave offers two output plugs for the test voltage. One test supply output is located at the front and one at the rear of the unit. The test supply outputs are connected in parallel.

The sense plugs are located at the rear of the unit. The external sense inputs allow the power system output voltages to be monitored directly at

the load and must be connected to the load when the sense is

Connector	AC Mode	DC Mode		
HIGH (L)	Phase	positive		
LOW (N)	Neutral	negative		
PE	PE	PE		

The sense is switchable to internal or external

- 1 Ventilator controller part
- 2 Framebus IN / OUT
- 3 Serial from DPA 500N / 503
- 4 Trigger IN1 / IN2
- 5 Trigger OUT1 / OUT2
- 6 Ethernet port
- 7 USB port
- 8 DUT monitor
- 9 GPIB / IEEE 488 port
- **10** Heat Sink air output
- **11** Ventilator (output)
- 12 Safety circuit
- **13** Fuse 3.15 A slow blow (ctrl)
- 14 Mains in CEE 32 A 3x400 V
- **15** Sense input
- **16** Test supply output

4.2.2.Rear view NetWave 7.3

The upper part of the NetWave is the control part. The control plugs are at the rear side of the NetWave available.

Additionally, to the other models, the NetWave 7.3 has two additional BNC Connectors (17) which allows extended functionality (see annex 9.2).



- **1** Ventilator controller part
- 2 Framebus IN / OUT
- 3 Serial from DPA 500N / 503
- 4 Trigger IN1 / IN2
- 5 Trigger OUT1 / OUT2
- 6 Ethernet port
- 7 USB port
- 8 DUT monitor
- 9 GPIB / IEEE 488 port
- 10 Heat Sink air output
- 11 Ventilator (output)
- 12 Safety circuit
- 13 Fuse 3.15 A slow blow (ctrl)
- 14 Mains in CEE 32 A 3x400 V
- 15 Sense input
- 16 Test supply output
- 17 Arbitrary Generator Signal Output & Input

17 Sync out – Source Input

Connection from the arbitrary generator to the amplifier. In case of using an external signal generator., the Signal must connect to source input BNC plug.

4.2.3.Rear view NetWave 7.x System with DPA 500N



4.3. 3-ph systems

4.3.1.Front view NetWave 20.x / 30.x / 60.x / 67.x

Standard NetWave



NetWave with Opt-3 Recovery



- 1 NetWave controller
- 2 Load hook
- 3 Main Switch
- 4 Control relays and fuses
- 5 Phase generator
- 6 Input transformer
- 7 Coasting

- 1 NetWave controller
- 2 Load hook
- 3 Main Switch
- 4 Control relays and fuses
- 5 Phase generator
- 6 Input transformer
- 7 Coasting
- 8 Recovery module (option)

Note: For the function of the NetWave controller see chapter Front view

Standard NetWave

									- 1
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							-	!	- 4
									- 6
									-

NetWave with Opt-3 Recovery



- NetWave controller
- 2 Load hook
- 3 Main Switch
- 4 Control relays and fuses
- 5 Phase generator
- 6 Input transformer
- 7 Coasting
- 8 Recovery module (option)

Note: For the function of the NetWave controller see chapter Front view

- 1 NetWave controller
- 2 Load hook
- 3 Main Switch
- 4 Control relays and fuses
- 5 Phase generator
- 6 Input transformer


- Mains Supply input 3x400 V
- 2 Control output panel
 - Control signals
 - Trigger input
 - Trigger output
 - Interface

1

- 3 Output panel for
 - EUT power
 - Sense
 - Interlock
 - Floating switch
- 4 Recovery module (option)

4.3.4.Rear view NetWave 60.x / 67.x



- 1 Mains Supply input 3x400 V
- 2 Output panel for
 - EUT power parallel mode
 - EUT power
 - Sense
 - Interlock
 - Floating switch
- 3 Control output panel
 - Control signals
 - Trigger input
 - Trigger output
 - Interface
- 4 Recovery module (option)

4.3.5.Rear view NetWave 90.x / 108.x



4.3.6.Control Unit - Output Panel



- Recovery module (option)
- Mains Supply input 3x400 V
- Output panel for
- EUT power
- Sense
- Interlock
- Floating switch
- Control output panel
- Control signals
- Trigger input
- Trigger output
- Interface
- Output panel for
 - EUT power parallel mode
- Signal out (control)
- 2 Source in (control)
- 3 Trigger IN1/2
- 4 Trigger OUT 1/2
- 5 GPIB / IEEE 488 port
- 6 USB for data storage
- 7 Ethernet port
- 8 Serial from DPA 503
- 9 Framebus OUT
- 10 DUT monitor
- USB 2 option measuring board 11

1 Signal OUT



SOURCE IN

2 Source IN

SIGNAL

Analogue output signal for control the amplifier of the NetWave phase L1, L2, L3.

The analogue signal has an output range of ± 10 V

For operating make sure that the cable bridge between Signal OUT and Source IN is done

Analogue input to the amplifier of the NetWave phase L1, L2, L3.

The analogue signal has an output range of ± 10 V

For operating make sure that the cable bridge between Signal OUT and Source IN is done









- Signal out (control)
- 2 Source in (control)
- 3 Trigger IN1/2
- 4 Trigger OUT 1/2
- 5 GPIB / IEEE 488 port
- 6 USB for data storage
- 7 Ethernet port
- 8 Serial from DPA 503
- 9 Framebus OUT
- 10 DUT monitor
- 11 USB 2 option measuring board

3 Trigger IN

More information sees rear side 1-phase NetWave in the previous chapter



- Signal out (control)
- 2 Source in (control)
- 3 Trigger IN1/2
- 4 Trigger OUT 1/2
- 5 GPIB / IEEE 488 port
- 6 USB for data storage
- 7 Ethernet port
- 8 Serial from DPA 503
- 9 Framebus OUT
- 10 DUT monitor
- 11 USB 2 option measuring board

8 Serial from DPA port

SERIAL FROM DPA



Pin assignment

RS 232 port 9 pole Sub D male connector

Control bus for remote control the NetWave AC source. The Harmonic and Flicker analyzer DPA 500N or DPA 503 will control the NetWave complete via the net.control software.

NetWave	Signal	Signal	DPA
9- Pol SubD m			9- Pol SubD f
1	CD		7
2	TxD	 RxD	3
3	RxD	 TxD	2
4	DTR		6 / 8
5	GND	 GND	5
6	DSR		4
7	RTS		1
8	CTS		4
9	RI		9
	screen	screen	

9 Framebus OUT





This port is used as communication and control bus between EM Test devices.

NetWave 3-phase NetWave models the framebus is internal (Source L3) terminated with the

Framebus Termination Part No 101732 Using an external device (AMP 200Nx.x), the termination at the ext. device is required

10 DUT monitor

DUT MONITOR



DUT monitor for any fail detection. DUT Monitor 1: DUT Monitor 2:



Function:

Input signal: Negative slope.

NOTE: The signal must be released to high before you start the next wave. The test will start and does not stop if the monitor signal is at low level during the wave start

Settings

The DUT monitor is settable in the NetWave software and has the following function

Disabled	no function
Stop	stops immediately the wave
Notify	send a message to DUT Log file





- Signal out (control)
- Source in (control) Trigger IN1/2

- Trigger OUT 1/2 GPIB / IEEE 488 port
- USB for data storage
- Ethernet port Serial from DPA 503
- Framebus OUT
- DUT monitor
- 11 USB 2 option measuring board

11 USB Interface for Measure & Analyze option



USB interface to operating PC, for the Measure & Analyze Option

Only required if NWBoard 3Phase Option is available

4.3.7. Power panel



NetWave 20.5 / 30.5



- Mains supply input terminal
- 2 EUT Power output plug
- 3 Sense input
- 4 **Emergency switch**
- 5 Interlock 6

1

- Switch Floating / Grounded
- EUT Power output CEE plug 7

Mains supply input terminal

- 1 2 EUT Power output plug
- 3 Sense input
- 4 **Emergency switch**
- 5 Interlock- control
- 5 Interlock- AUX
- 7 Switch Floating / Grounded

NetWave 60.x / 67.x / 90.x / 108.x (except .5 models)



- EUT Power output terminal
- 2 EUT Power output plug
- 3 Sense input
- 4 Emergency interlock
- 5 Interlock

1

6 Switch Floating / Grounded

NetWave 67.5 / 90.5 / 108.5



- EUT Power output terminal
- EUT Power output plug 2
- 3 Sense input

1

- 4 Emergency interlock
- 5 Interlock – control
- 6 Interlock - AUX
- 7 Switch Floating / Grounded

EUT output terminal

NetWave 20.x / 30.x

MAIN SUPPLY



Power output Terminal

- 1 Plugs for L1, L2, L3, N, PE connection. The size depends on model current.
- 2 Bracket for cable fixing.

NetWave 60.x / 67.x / 90.x / 108.x



Test supply output Safety labor plugs 6 mm



Sense input (available on models with serial number P1817220350 and above)

Front View of Pin Insert



Emergency Switch



The sense is **switchable to internal or external** The sense plugs are located at the rear of the unit. The external sense allows monitoring directly at the load. The sense must be set to external.

Connection:	Pin	Phase
	А	L1
	В	L2
	С	L3
	D	Ν

Connection of the emergency stop button. When operated, the input main circuit breaker will be opened and the system de-energized.

an appliance connector and with plugs as a coupler.

A voltage of 24Vac is present at the connector.

Connector: Hirschmann STAS 20 with safety loop Max. AC : 250 V / 16 A

Interlock



Switch Floating / Grounded





Two versions of the Interlock exist, depending on the model.

Note for .5 models:

the interlock CONTROL must be closed to enable the output. Use either the delivered INTERLOCK Terminator or other external switch.

See chapter 10.2 for further explanations.

Switch to open/close the Neutral – Ground(PE) connection

Default setting: PE

Floating:

- Is used when - the power system reference is floating and the ground (PE) is not connected to neutral inside the NetWave
 - PE is connected to any line
 - the test requirement defines another PE reference

Max voltage between: Line to PE and Neutral to PE

For all models except xx.5:

	V ac (rms)	Vdc
Line to PE:	430 V	600 V
Neutral to PE:	360 V	500 V

Note: in High Voltage DC Mode (Opt-3 DC-EVR) the voltage is limited to 600VDC when the switch is set to "floating". This prevents the damage of the internal voltage limiters to be overloaded in case of a wrong connection.

Note: see chapter 9.10 for special conditions when the optional insulation monitoring device (Opt-3 IMD) is installed.

For xx.5 models:

	V ac (rms)	Vdc
Line to PE:	700 V	1000 V
Neutral to PE:	360 V	500 V

Test supply output terminals



Power Output connector CEE Type 32 A 5 pole 3 x 690 V



4.3.8.Opt-3 Parallel Mode - NetWave 20.x and 30.x (Option)

The parallel mode will connect all three internal sources together in parallel. The common 1-phase output is on a terminal block (2) where the user must connect the EUT. The other EUT terminals for 3-phase operating are disconnected from the source.

All 3 sources are connected in parallel

- Using for AC and DC
 - 3 times more current capability for
 - nominal current
 - inrush current Imax (3s)
 - repetitive peak current



Mains supply input terminal EUT parallel mode output 1 phase terminal

Rated power in parallel mode

The technical performance in parallel mode is addition of the 3-phase values for all parameters. The same addition is valid for the recovery functions.

	NW 20	NW 30
Nominal current (rms) constant	78 A	99 A
Inrush current Imax rms (3s)	141 A	198 A
Repetitive peak current	600 A	750 A
Output screw terminals max.	50 mm ²	50 mm ²

Parallel Mode: Enable / Disable



For **enable the parallel mode** the NetWave must - set to **"Only one phase"** operating mode - set to **OFF MODE**

The parallel mode can be activated as follow:

- At the NetWave control panel
- Software Device setup

Schematics internal NetWave wiring

The figure illustrates the internal NetWave wiring for power output.

A contactor switch disconnects the 3-phase output plugs in case of parallel mode.



4.3.9.Opt-3 Parallel Mode - NetWave 60.x / 67.x / 90.x / 108.x (option)

The parallel mode will connect all three internal sources together in parallel. The common 1-phase output is on a terminal block (2) where the user must connect the EUT. The other EUT terminals for 3-phase operating are disconnected from the source.

- All 3 sources are connected in parallel
- Using for AC and DC

- inrush current Imax (3s)
- repetitive peak current



NW 60.x / 67.x

NW 90.x / 108.x

- 1 EUT parallel mode output 1 phase
- 2 EUT Power output terminal 3 phase
- for NetWave 60.x/67.x 3 EUT parallel mode output 3 phase for NetWave 90.x/108.x

Rated power in parallel mode

The technical performance in parallel mode is addition of the 3-phase values for all parameters. The same addition is valid for the recovery functions.

	NW 60.x / 67.x	NW 90.x / 108.x
Nominal current (rms) constant	198 A	300 A
Inrush current Imax rms (3s)	300 A	450 A
Repetitive peak current	400 A	500 A
Output screw terminals max.		Ø16 mm, 300 mm ²

Parallel Mode: Enable / Disable



For **enable the parallel mode** the NetWave must - set to **"Only one phase"** operating mode - set to **OFF MODE**

The parallel mode can be activated as follow:

- At the NetWave control panel
- Software Device setup

Schematics internal NetWave wiring

The figure illustrates the internal NetWave wiring for power output.

A contactor switch disconnects the 3-phase output plugs in case of parallel mode.



4.3.10. Floating operation

With the switch "**FLOATING - PE**" the user defines the connection between **Neutral and Earth**. In general, the neutral is connected to PE at the distribution point of the power supply. In the real field applications are many solutions that have different earth connection solutions. Therefore, many standards recommend a test setup

where the power supply is grounded on different points. This Switch allows the user to disconnect the PE very easy and in shortest time for modify his test setup.



4.4. Power connection and fuse location

4.4.1.NetWave 20.x and 30.x

The fuses are located at the right side of the Unit. For access to the fuses the user must open the four screws and disassemble the right-side wall.



Fuse list

Number	Current [A]	Dimension [mm]	Туре	Description
F1 – F3	80	22x58	gG	General Input Line
F4 – F6	1	10x38	aM	Charge resistor
F7 – F8	5	10x38	aM	Input Auxiliary Transformer
F9 - F10	5	5x20	WGT	Output Auxiliary Transformer
F11 – F12	3.15	5x20	WGT	NetWave Controller
F13 – F14	2.5	5x20	WGT	Auxiliary Supply Inverter Phase R
F15 – F16	2.5	5x20	WGT	Auxiliary Supply Inverter Phase S
F17 – F18	2.5	5x20	WGT	Auxiliary Supply Inverter Phase T
F19 – F20	2.5	5x20	WGT	Ventilation Fan
F21 – F22	1	5x20	WGT	Safety Circuit

The layout may be different depends the model design

4.4.2.NetWave 60.x / 67.x



Fuse list

Number	Current [A]	Dimension [mm]	Туре	Description
F1 - F3	160	Blade	NH00	General Input Line
F4 - F6	50	14x51	gG	Line Inverter Phase R
F7 - F9	50	14x51	gG	Line Inverter Phase S
F10 - F12	50	14x51	gG	Line Inverter Phase T
F13 - F15	1	10x38	aM	Charge resistor Phase R
F16 - F18	1	10x38	aM	Charge resistor Phase S
F19 - F21	1	10x38	aM	Charge resistor Phase T
F22 - F23	4	10x38	aM	Input Auxiliary Transformer
F24 - F25	6.3	5x20	WGT	Output Auxiliary Transformer
F26 - F27	3.15	5x20	WGT	NetWave Controller
F28 - F29	2.5	5x20	WGT	Auxiliary Supply Inverter Phase R
F30 - F31	2.5	5x20	WGT	Auxiliary Supply Inverter Phase S
F32 - F33	2.5	5x20	WGT	Auxiliary Supply Inverter Phase T
F34 - F35	2.5	5x20	WGT	Ventilation Fan
F36 - F37	1	5x20	WGT	Safety Circuit
F38 - F39	not used	5x20	WGT	Optional EM Test Equipment

The layout may be different depends the model design



Front side Fuse list

Number	Current [A]	Dimension [mm]	Туре	Description
F4 - F6	100	14x51	gG	Line Inverter Phase R
F7 - F9	100	14x51	gG	Line Inverter Phase S
F10 - F12	100	14x51	gG	Line Inverter Phase T
F13 - F15	1	10x38	aM	Charge resistor Phase R
F16 - F18	1	10x38	aM	Charge resistor Phase S
F19 - F21	1	10x38	aM	Charge resistor Phase T

Regenerative Fuse list (if with related Option)

Number	Current [A]	Dimension [mm]	Туре	Description
F1 – F3	100	14x51	gG	Line Inverter Phase T
F4 – F6	100	14x51	gG	Line Inverter Phase S
F7 – F9	100	14x51	gG	Line Inverter Phase R



Rear side Fuse list

Number	Current [A]	Dimension [mm]	Туре	Description
F1 - F3	250	Blade	NH1	General input line
F22 / F23	8	10x38	aM	Input Auxiliary Transformer
F24 / F25	15	5x20	WGT	Output Auxiliary Transformer
F26 / F27	6.3	5x20	WGT	NetWave Controller
F28	6.3	5x20	WGT	Auxiliary supply phase R neutral
F29	2.5	5x20	WGT	Auxiliary supply phase R phase
F30	2.5	5x20	WGT	Inverter phase R module 1
F31	2.5	5x20	WGT	Inverter phase R module 2
F32	6.3	5x20	WGT	Auxiliary supply phase S neutral
F33	2.5	5x20	WGT	Auxiliary supply phase S phase
F34	2.5	5x20	WGT	Inverter phase S module 1
F35	2.5	5x20	WGT	Inverter phase S module 2
F36	6.3	5x20	WGT	Auxiliary supply phase T neutral
F37	2.5	5x20	WGT	Auxiliary supply phase T phase1
F38	2.5	5x20	WGT	Inverter phase T module 1
F39	2.5	5x20	WGT	Inverter phase T module 2
F40 / F41	1	5x20	WGT	Safety Circuit
F42 / F43	Not used	5x20		Optional equipment

4.4.4.NetWave 108.x



Front side Fuse list

Number	Current [A]	Dimension [mm]	Туре	Description
F4 - F6	125	14x51	gG	Line Inverter Phase R
F7 - F9	125	14x51	gG	Line Inverter Phase S
F10 - F12	125	14x51	gG	Line Inverter Phase T
F13 - F15	1	10x38	aM	Charge resistor PhaseR
F16 - F18	1	10x38	aM	Charge resistor Phase S
F19 - F21	1	10x38	aM	Charge resistor Phase t

Regenerative Fuse list (if with related Option)

Number	Current [A]	Dimension [mm]	Туре	Description
F1 – F3	125	14x51	gG	Line Inverter Phase T
F4 – F6	125	14x51	gG	Line Inverter Phase S
F7 – F9	125	14x51	gG	Line Inverter Phase R



Rear side Fuse list

Number	Current [A]	Dimension [mm]	Туре	Description
F1 - F3	315	Blade	NH1	General input line
F22 / F23	8	10x38	aM	Input Auxiliary Transformer
F24 / F25	15	5x20	WGT	Output Auxiliary Transformer
F26 / F27	6.3	5x20	WGT	NetWave Controller
F28	6.3	5x20	WGT	Auxiliary supply phase R neutral
F29	2.5	5x20	WGT	Auxiliary supply phase R phase
F30	2.5	5x20	WGT	Inverter phase R module 1
F31	2.5	5x20	WGT	Inverter phase R module 2
F32	6.3	5x20	WGT	Auxiliary supply phase S neutral
F33	2.5	5x20	WGT	Auxiliary supply phase S phase
F34	2.5	5x20	WGT	Inverter phase S module 1
F35	2.5	5x20	WGT	Inverter phase S module 2
F36	6.3	5x20	WGT	Auxiliary supply phase T neutral
F37	2.5	5x20	WGT	Auxiliary supply phase T phase1
F38	2.5	5x20	WGT	Inverter phase T module 1
F39	2.5	5x20	WGT	Inverter phase T module 2
F40 / F41	1	5x20	WGT	Safety Circuit
F42 / F43	Not used	5x20		Optional equipment

4.5. Functions on NetWave 7.3, 20.x, 30.x, 60.x, 67.x, 90.x, 108.x

4.5.1.Setup Menu

These NetWave models offer in the setup menu additional functions:

Select Operation Mode.

Standard:	Operating with software
-----------	-------------------------

- Simple AC: Operating with external commands from a XML file
- **Source AC:** AC Synchronization with an external rectangular signal
- **External:** Analogue signal generation with an external signal generator

Mode Menu



Figure 8.2.1 Setup Menu



* This Menu is only with a NetWave 7.3, 20, .20.2, 20.3, 30, 30.2, 30.3, 60, 60.2, 60.3, 90.2, 90.3 available

4.5.2.Simple AC Mode

In the Simple AC Mode, The NetWave can run locally stored XML Simple Wave Files (XYZ.ssa) or receive commands by remote.

The programmable Trigger Signal in the Simple AC mode is provided to Trigger Out 2 (Max. voltage: 24V (pull up) / Current: 100mA)

XML Simple Wave Files describes a selection of phenomenon to be played, which is easy to read and write for the User. All these Files are manually written by the User and can be managed through remote commands. The management of the commands must be done by the User or by third party software through the GPIB or Ethernet connection of the NetWave.

For detailed information about XML Simple Wave Files and programming code, please refer to the separate User Manuals; XML Simple Wave File and Remote Manual, which are delivered with NetWave .

AMETEK CTs

4.5.3. Source AC Mode

In Source AC Mode, the NetWave is used as a simple AC Source, while the output is synchronized to a reference signal on the BNC Trigger IN 2. Reference Signals from 40 Hz to 100 Hz will be synchronized on the output of the NetWave, if the reference signal is within 10% of the nominal frequency set on the NetWave.

The source AC mode is used when testing dips and interruptions with a PFS 503Nxx.2 according IEC 61000-4-11 / -34.

The PFS 503N delivers the sync signal, generated with a PLL from the mains frequency, to the 3-phase NetWave, BNC input **Trigger IN 2**.



The LED of the Output is blinking, as long the Synchronization is working properly.

OUTPUT ACTIVE

OL1	
OL2	
0	

OL3

If there is a value selected outside the working range of Source AC Mode (40Hz – 100Hz), the Display shows this (!) symbol. If this symbol is displayed, the synchronization on the reference signal is no more working.

Power Source	Mode	Un	(!) Fn
L1-L3:	AC	100.00V	105.00Hz
MODE START STOP	•	→ SETUP	

Reference Signal on BNC Trigger IN 2:

The Reference signal shall be a Rectangular Signal with an amplitude of: Low = 0.0V / High = 2.5V - 5.0V

4.5.4. External Mode

In External Mode, the NetWave is used as an Amplifier for AC or DC signal. The amplification factor is 50.91 on Peak or DC Value

The External Mode can only be selected locally on the unit through the front Panel of the NetWave. Even in External mode, the parameter of a Mainline must be configured: AC or DC Mode / Voltage / Frequency / Current Limiter and Sense mode

For Operate the unit in External mode, the Loop BNC-Cable between Signal Output and Source Input need to be removed, and the External Arbitrary Signal Generator must be connected to Source Input (refer also to Chapter 3.3 for 1 Phase System or Chapter 3.5 page 39 for 3 Phase System).

Reference Signal on BNC Source Input:

The Reference signal shall be within following limits: Amplitude : max 10Vpp AC / \pm 10V DC Frequency: 10 Hz up to 5 kHz in AC Mode / DC up to 5 kHz in DC Mode

5. **Front Panel Operation**

5.1. Power on

NetWave 3 or 7 Version 5.10				230V 50Hz		
MODE	START	STOP	•	•	SETUP	

After switching on, NetWave needs approx. 35s for booting. During this time the display is blank. NetWave is ready when the display shows NetWave and the current version.

The NetWave is operated by an easy menu control system. Five function keys are available to select parameters and functions.

Navigate through the menu WaveGenerator, Measurement U/I and Wave

5.2. Menu structure

xchange to/ fi e of waveform	rom a memory stick for d	ata transfer to an externa	computer.
Net	Wave		
← →		MODE	
	Wave Generator	Mesurement U / I	Wave Manager
	230V 50Hz individual file 	AC measurement DC measurement	Delete file Copy file to USB Memory Stick Load file from USB Memory Stick
		Figure 3.1 Mode Menu	

There are two buttons for navigate through the menus.

MODE

SETUP

Manager.

SETUP button : Configuration of the device setting

5.2.1.Mode Menu

Figure 4.1 shows the handling of the Mode menu which rotates cyclic by pressing the **Mode** button.

WaveGenerator Name of the loaded file	voltage/frequency	1 st
Measurement U/I 230V / 15.98A		2 nd
WaveManager		

MODE button:

Menu or submenu title ine : line : Actual Menu Function

Wave Generator

Selection and run of the stored waves.

Generation of all kind of voltage profiles with the software.

Measurement U / I

Actual voltage and current delivered from the NetWave. The displayed measurement is from the internal measurement module from the AC/DC source.

Wave Manager

File e Delete **NetWave**

5.2.2.Menu WaveGenerator

Functions

- Selecting files
- Play files

OUTPUT ACTIVE

	The output active LED indicates - the active output (mains active) - the number of phases).
O ¹³	Note: Files with 3- phase waves indicate all output channels. The software delivers the detailed information about the wave.
I Status	blinking: Running Off: Ready to start

A selected wave will be repeated according to the selected number of "Cycle". The time counter begins after each restart at zero.



Work carefully when performing these tests, Hazardous voltages are present on output during this test.

1. Select with the in the buttons the desired file.



START STOP 2. Press ____ buttons for play and stop the wave.

230V / 50Hz 00:00:01 hours Filename U / I measurement button START Г 10s START T STOP Filename 230V / 50Hz Break at 00:00:10 hours 230V / 50Hz 00:00:11 hours START Filename U / I measurement Г CONTINUE START 10s

Start, Break and Continue



5.2.3.Menu Measurement U / I

This function shows the actual voltage and current delivered from the NetWave generator.

The measurement is taken from the internal power source measurement module

Range	Acc	curacy (Full scale)
oltage 0-300V	< 11	%
urrent 0-50A	< 1'	%
oltage ±425V	< 1	%
urrent 0-50A	< 1'	%
	Ditage 0-300V urrent 0-50A	RangeAccbltage0-300V< 1

5.2.4. Menu Wave Manager

Functions

- Copy file to USB Memory stick
- Load file from USB Memory stick
- Delete file



Select a file and

- Delete
- Copy
- Load



5.2.5.Setup Menu

In the setup menu all settings of the NetWave can be done manually. The following figures show the configuration of the different parameters.

How to navigate in the Setup menu

Figure 3.2 shows the handling of the Setup menu. The small buttons inside the circle shows how to step through the menu or parameter list.

Mode Menu



Figure 4.2 Setup Menu

This Menu is only available on the NetWave 7.3, 20.x, 30.x, 60.x, 67.x, 90.x and 108.x (delivered 2012 or later). For more Information, please refer to Annex 8.2.

5.2.6. Power Source

Parameter for control the power source, NetWave calculate automatically the correct output signal for control the source.

The procedure to enter all variables (grey marked for settings) is shown in the highlighted displays below.

NetWa	ave
-------	-----

	Configuration Power Source	L1	Selected output Cyclic settings for	channel for setting the parameters. or L1 to L3 if available
	Power Source Mode Un Fn L1-L3: AC 230.00V 50.00Hz	Mode	AC or DC	
	Power Source Mode Un Fn	Un	Output Voltage	: AC rms / DC
	Power Source Phase Delay	Fn	Frequency	: AC only
AC	L1-L3: 0°+15° / 120°+00° / 240°-15° Power Source I Limiter	(!)	The 3-phases ar	e not identical (internal and/or external)
	L1-L3: (L1) Disable Intern Power Source I Limiter Sense L1-L3: (L1) (Cont.) 20A Intern Power Source I Limiter Sense L1-L3: (L1) (Stop) 20A Intern	Limiter	Settings for the o 1 st set 2 nd set	current limiter function (see below) : RMS or Peak : Disable, Stop, Continuous
Example	Power Source I Limiter Sense L1-L3: S 20 / X / S 20A Intern	I Limiter	Current value	: 2100A dep. on model, mode, frequency
		Sense	Sense input below)	: internal / external and compensation (see
		The exampl	e shows the settir L1 Stop 20A, L2 disabled L3 Stop 20A	ngs:
DC	Power Source Mode Un L1: DC 100.00V Power Source I Limiter Sense L1: (Stop) 20A Intern	This examp L1: Is set to	le shows: internal source	

L2: Use a looped AMP

L3: Use an external DC source controlled by L3

Current limiter function

Source (L2)

L1-L3: (L1)

Example for L1-L3 DC

DC

Mode Amp DC

Un 115.00V

Un 115.00V

Un

RMS the current limiter is based on and limits the RMS value of the output current. When the output current reaches the set limit, the rms current is reduced to stay within the set limit (Continuous mode) or stops (STOP mode). The output voltage is not distorted. The mode works best for passive loads but can be instable in case of active loads (i.e. batteries or converters)
 Peak the current limiter is based on and limits the peak current. When the peak current reaches the set limit, the peak current is clipped (continuous mode) or stopped (STOP mode). This might lead to a distorted voltage signal. This mode is best for active loads (i.e. batteries or chargers) or if the load draws high peak currents

STOPThe power is switched off when the current reaches the programmed valueContinuousReduces the voltage in case of tripping until the programmed current is reachedDisableNo current limit. Allows the max. inrush current for 3 to 6 seconds and switch the power off if it does not reduce

Depends on the source model; indicates the numbers of phases.

- L1 for single phase equipment (L1, N, PE)
- L1 + L2 180° phase shift split power (L1, L2, N, PE)
- L1 L3 for 3-phase equipment (L1, L2, L3, N, PE)

The current limiter function works also for reverse currents (power sink mode).

Sense function



setting, but there is no warning if compensation cannot be achieved.

The sense function allows to compensate a voltage drop in the cabling from the NetWave to the EUT. The sense input (one per phase) is available on the Sense connector on the power panel (see chapter).

There are two operating modes:

- Internal the sense input is inactive and the NetWave senses internally. No voltage drop in the cabling is compensated.
- External the sense input is active. All inputs must be connected to the desired sense point (i.e. input connectors of the EUT).

Furthermore, the compensation can be set:

Off no compensation

On 5/10/15% a voltage drop up to maximum 5/10/15% is compensated

On Auto Auto compensation setting means 15% for mainline less than 100V and 5% for greater than 100V.

Mode of value setting

The user has a choice of two modes for edit values for voltage and frequency parameters.

The "normal" mode is the usual one, and is done in two steps:

- First step to setup the integer part
- Second step to setup the fractional part.

The "all step editors" mode selects each digit from left to right and the value is parsed sequentially.

Toggle between the two edit modes with the button MODE

"Normal" Mode

230.00 $\overrightarrow{}$ →SETUP→230.00 $\overrightarrow{}$ →SETUP→next value to setup

Available keys:

STOP: Ends the edition, discarding any changes

LEFT: Decrease the value with acceleration

RIGHT: Increase the value with acceleration

SETUP: Move from integer part to fractional part and then validate the setting

MODE: Change edition mode to "All Step Edition"

Note: In this mode, when you are setting the integer part, the fractional is set to zero.

"All Step Edition" Mode

230.00V→SETUP→230.00V→SETUP→230.00V→SETUP→230.00V→SETUP→230.00V→SETUP→next value to setup

Available keys:

STOP: Ends the edition, discarding any changes

LEFT: Decrease the value with acceleration

RIGHT: Increase the value with acceleration

SETUP: Move the edited digit step by step from the left to right position / validate the setting

MODE: Change edition mode to "Normal"

Note: in this mode, any acceleration on LEFT or RIGHT key is disabled.

5.2.7.Source Mode

This menu set the source Mode of each line to one of the following mode:

- Intern,
 - Extern (only in DC mode) or
 - AMP200.

Source mode cannot be changed when parallel switching is enabled (parallel switching requires all source as intern defined).

Source Mode L1: Intern	Polarity Bipolar	Input 10.00V	Output 509.12V	Source Mode:	- Intern, - Extern (only in DC mode) or - AMP200.
				Polarity:	Polarity for DC mode - Unipolar - Bipolar
				Input:	Input voltage for external source range [1;10]
				Output:	Output voltage range [10;999],according to the external source capacity
				Remark:	For Intern and AMP200N , Polarity, Input and Output Voltage are displayed for information and are not settable .
4	<u> </u>			Remark:	This menu is only available for NetWave that have external connectors for (signal out/source in bridge). Availability is strongly related to Extern AC/DC operation mode capability (only in the way that externalized connectors are present).

5.2.8. Operation Mode

This Menu is only available on the NetWave 7.3, 20.x, 30.x, 60.x, 67.x, 90.x and 108.x. For more Information, please refer to Annex 9.2.

Setting of the Operation Mode gives you the option to use the NetWave in following Modes: Standard, Simple AC or Source AC.

Configuration Select Operation Mode	
Select Operation Mode Standard	

Standard : Default :	NetWave operates as described in this manual. Standard
Simple AC:	NetWave is remote controlled or can play XML SimpleWaveFiles (XYZ.ssa) which are stored on the NetWave. Refer to Annex 9.2.2
Source AC:	NetWave is used as a AC Source, where the output is synchronized to a Reference signal on Trigger IN 2 Refer to Annex 9.2.3
External:	NetWave is used as an Amplifier for the Reference signal applied to BNC External Signal IN Refer to Annex 9.2.4

5.2.9.Number of phases

On 3 Phase Systems like NetWave 20.x / 30.x / 60.x / 90.x you can set the system in Single Phase or Three Phase Mode.



5.2.10. Parallel Mode (Opt-3 Parallel)

The parallel mode is only available when the NetWave is set to "Only one phase" and the options





- **Enable**: All three phases are in parallel operating. The EUT output is separate plug with screw connections.
- **Disable**: All three phases are in normal operating. The EUT output is standard plug.
- **Note:** The parallel Mode will disconnect the power from the 3-phase output plug.

Parallel mode cannot be enabled if all sources are defined to internal.

With this option it is possible to double the DC voltage range by using two phases simultaneously. The phase 1 is used for +DC and the phase 2 is used for –DC pole. The using of this function is only supported by net.control software.



5.2.12. External Transformer

If an external output transformer is connected, this factor defines the multiplier for set the output voltage.



Function	Disabled : Default setting (Factor = 1.000) Enabled: Set factor is used to calculate the EUT test voltage.
Factor:	0.300 to 3.000 step resolution 0.001 Example: a step-up transformer with a transformation ratio of 2.000 is used to double the output voltage. In this case a factor of 2.000 must be set.

Default: 1.000 (Disabled)

5.2.13. Standalone / Master / Slave

Standalone/Master/Slave Standalone		Standalone:	The NetWave works as standalone device.		
Standalone/Master/Slave Master (L1, L, +)	MultiSource	Master (L1):	The NetWave works as a Master in parallel mode and		
Standalone/Mast <u>er/Slave</u> Master (L1, L, +)	CascadeSource		Slave NetWave(s).		
Standalone/Master/Slave Slave (L2, N, -)			"CascadeSource"		
Standalone/ <u>Master/Slave</u> Slave (L3)		Slave (Lx):	The NetWave works as a Slave in parallel mode and is phase L2 or L3 (depends on the installed firmware). The controller of the Master NetWave controls the slave power stages directly. The controller of the		

See chapter 6.3 for instructions how to change from Master to Slave operation.

Slave NetWaves is inactive.

5.2.14. Trigger

Setting of the trigger status for "Trigger IN" and "Trigger OUT". The trigger can be settled in the software.

Configuration Trigger	Enable:
Trigger Enable	

able: Function of Trigger IN is enabled. - Trigger IN 1, IN 2 Default : Enabled

Disable: Function of Trigger IN is disabled. - Trigger IN 1, IN 2

5.2.15. DUT Monitor

Open collector input for event control during a test or record.

Configuration DUT Monitor DUT Monitor	The DUT Monitor 1 and DUT Monitor 2 controls the behavior during a test or record. The following settings are offered for the two DUT monito inputs					
Input 1/2: Disable Notify Stop	Default :	Disable	d			
	Settings DUT Monitor (open collector input)					
	- Disable: - Notify: - Break: - Stop:	Input ha Messag Wave b Continu Wave s	as no fur je will be reaks, n e accore tops the	nction e written on a nainline is pla ding the user test	file ayed during the decision	e break.
5.2.16. GPIB Address						
GPIB Address for using the NetWave Configuration	with the softwa Standard :	are IEEE 48	38			
GPIB-Address GPIB-Address 18	Address : Default :	130 10	Defau	It address for	r software	
5.2.17. Ethernet IP- Address	5					
Set Ethernet IP Address of the target I Configuration Ethernet IP-Address	NetWave Selectable	range :	0.0.0.	0 to 255.255.	255.255	
Ethernet IP-Address 10.0.0.2	Default Add	dress :	10.0.0).3		
5.2.18. Ethernet Netmask Set Ethernet Netmask of the target Ne	etWave					
Configuration Ethernet Netmask	Selectable	range :	0.0.0.	0 to 255.255.	255.255	
Ethernet Netmask 255.0.0.0	Default Net	mask :	255.0	.0.0		
5.2.19. Ethernet Gateway						
Configuration Ethernet Gateway	stvvave Selectable	range :	0.0.0.	0 to 255.255.	255.255	
Ethernet Gateway 10.0.0.1	Default Gat	eway:	10.0.0).1		
5.2.20. Date						
Configuration Date (Day/Month/Year)	Day : Month [·]	131 1 12				
Date (Day/Month/Year) 18/11/2006	Year :	20002	2200			
	Note:	When p returns	ressing after fev	Setup for exits seconds de	it the Date setu elay to the Con	up, the display figuration display
5.2.21. Time						
The time is used for marking the store	d files. Format ·	нн мм	·SS	(H·Hour	M · Minute	S Second)
Time	Mode :	24 hour	s / day	(11.11001		G.Second)
16:25:05			-			

Note: When pressing Setup for exit the Time setup, the display returns after few seconds delay to the Configuration display

5.2.22. LCD Contrast

The LCD Contrast is selectable between the values 70 to 100.

Configuration LCD Contrast	
LCD Contrast 100	

5.2.23. Language

Selection of the desired language.	
Configuration Language / Sprache	
Language / Sprache English	

English : German : Default setting Change to German language

5.3. Warning and Alarm

5.3.1.Warning



If the user starts a programmed wave manually at the NetWave where the actual power setup does not fit the programmed wave.

The display shows a warning with the proposed power settings.

Remedy

- 1a. Press SETUP for direct enters the power setup or alternative
- 1b. Press STOP button for exit and press SETUP
- 2. Change the power setting with SETUP...
- 3. Start the test again.

5.3.2.Alarms



NetWave alarms are coded in binary values. The NetWave software will decode the messages separately and show it at the computer screen. In NetWave display the alarm is indicated in an addition of the binary error codes

Remedy

- 1. Press STOP button
- 2. Check the alarm reason
 - change the SETUP?
 - Problem in power supply?
 - Problem with EUT?

Binary values of the alarms

	Alarm	Meaning	Error Code binary value
Digit: x	CVMAX	Overvoltage	1
	CVMIN	Under voltage	2
	CTMAX	Overtemperature	4
	CCRT	Inverter	8
Digit: x -	IM	Limit Out (Overcurrent)	1
	DV	Limit Out (Overcurrent)	2
	DIM	Limit Out (Overcurrent)	4
	PE	Overvoltage PE	8
Digit: - x	LINE	Fault in Line	1
	OUT	Overvoltage Output	2
	BUS	Overvoltage Bus	4
	CRT	Sink Inverter	8
Digit: x	OVC	Limit Input Sink Current	1
-			2
			4
			8

Binary table of error messages



Examples:

5.3.3.Error Messages

ERROR: [Power Source 1 2 3]	Termination Adapter (Part No 101732) is not connected properly at the Framebus
	NetWave 1-ph: Check the terminating adapter at the Framebus OUT connector at the rear panel.
	NetWave 3-ph: Termination adapter is internal mounted at the AC-source for phase L3.
	This Adapter connects Pin 1 to 9 via a 120Ω resistor for terminate the Framebus.

6. Multi Source Operation

6.1. Opt-3 Multi Source

This schema shows the connection of three NetWaves to one NetWave MS.



The following steps are required to setup NetWave Multi Source :

- The NetWave Master (L1) is setup in the menu "Standalone/Master/Slave" to the mode "Master (L1). The Source is set to function "MultiSource".

Standalone/Master/Slave	
Master (L1, L, +)	MultiSource

The NetWave works as a Master in parallel mode and is phase L1. The controller controls the connected Slave NetWave.

- The NetWave Slave (L2) is setup in the menu "Standalone/Master/Slave" to the mode "Slave (L2)".

Standalone/Master/Slave Slave (L2, N, -) The NetWave works as a Slave in parallel mode and is phase L2. The controller is inactive. The NetWave hardware is controlled by the NetWave Master.

- The NetWave Slave (L3) is setup in the menu "Standalone/Master/Slave" to the mode "Slave (L3)".

Standalone/<u>Master/Slave</u> Slave (L3) The NetWave works as a Slave in parallel mode and is phase L2. The controller is inactive. The NetWave hardware is controlled by the NetWave Master.

- The Framebus OUT of the NetWave Master (L1) is connected to the Framebus IN of the NetWave Slave (L2)
- The Framebus OUT of the NetWave Slave (L2) is connected to the Framebus IN of the NetWave Slave (L3)
- The Framebus IN of the NetWave Slave (L3) muss be terminated with a Framebus Terminator
- The Signal OUT1 of the NetWave Master (L1) is connected to the Signal IN1 of the NetWave Master (L1)
- The Signal OUT2 of the NetWave Master (L1) is connected to the Signal IN2 of the NetWave Slave (L2).
- The Signal OUT3 of the NetWave Master (L1) is connected to the Signal IN3 of the NetWave Slave (L3).
- Each NetWave is supplied.
- The PC computer is only connected to the NetWave Master (L1).
- The EUT is connected for Phase L1 to the NetWave Master (L1), for Phase L2 to the NetWave Slave (L2) and for Phase L3 to the NetWave Slave (L3).
 The N from each NetWave are connected.
 The PE from each NetWave are connected.







The following steps are required to split off from NetWave Multi Source to single NetWaves :

- The Framebus OUT of the NetWave Master (L1) is not connected. -
- The Framebus OUT of the NetWave Slave (L2) is not connected.
- The Framebus IN of the NetWave Master (L1), NetWave Slave (L2) and NetWave Slave (L3) muss be terminated with a Framebus Terminator
- The Signal OUT1 of the NetWave Slave (L2) is connected to the Signal IN2 of the NetWave Slave (L2).
- The Signal OUT1 of the NetWave Slave (L3) is connected to the Signal IN2 of the NetWave Slave (L3).
- Each NetWave is supplied.
- The PC computer connected to the each NetWave.
- The NetWave Master (L1) is setup in the menu "Standalone/Master/Slave" to the mode "Standalone".

Standalone/Master/Slave Standalone

The NetWave Slave (L2) is setup in the menu "Standalone/Master/Slave" to the mode "Standalone".

Standalone/Master/Slave Standalone

The NetWave works as standalone device.

The NetWave Slave (L3) is setup in the menu "Standalone/Master/Slave" to the mode "Standalone".

Standalone/Master/Slave Standalone

The EUT is connected to each NetWave. The N from each NetWave are not connected. The PE from each NetWave are not connected. The NetWave works as standalone device.









The NetWave works as standalone device.

3 NetWaves in Standalone


6.2. Opt-3 CS (Cascade Source)

This schema shows the connection of two NetWaves to one NetWave CS.



This schema shows the connection of two NetWaves to NetWave CS with connection box.



The following steps are required to setup NetWave Cascade Source :

- The NetWave Master (L,+) is setup in the menu "Standalone/Master/Slave" to the mode "Master (L1, L,+). The Source is set to function "CascadeSource".

Standalone/Mast<u>er/Slave</u> Master (L1, L, +) CascadeSource The NetWave works as a Master in parallel mode and is phase L or +. The controller controls the connected Slave NetWave.

- The NetWave Slave (N,-) is setup in the menu "Standalone/Master/Slave" to the mode "Slave (L2, N, -)".

Standalone/Master/Slave Slave (L2, N, -) The NetWave works as a Slave in parallel mode and is phase N or -. The controller is inactive. The NetWave hardware is controlled by the NetWave Master.

- The Framebus OUT of the NetWave Master (L,+) is connected to the Framebus IN of the NetWave Slave (N,-)
- The Framebus IN of the NetWave Slave (N,-) muss be terminated with a Framebus Terminator.
- At the Signal OUT1 of the NetWave Master (L,+) a BNC T-Adapter is connected.
- The Signal OUT1 (BNC T-Adapter) of the NetWave Master (L,+) is connected to the Signal IN1of the NetWave Master (L,+)
 - The Signal OUT1 (BNC T-Adapter) of the NetWave Master (L,+) is connected to the Signal IN2 of the NetWave Slave (N,-).
- Each NetWave is supplied.

_

- Switch the PE at NetWave Master (L,+) to ground.
- Switch the PE at NetWave Slave (N, -) to floating.
- The PC computer is only connected to the NetWave Master (L,+).
- The EUT is connected to each NetWave. The N from each NetWave are not connected. The PE from each NetWave are not connected.









The following steps are required to split off from NetWave Cascade Source to single NetWaves :

- The Framebus OUT of the NetWave Master (L) is not connected.
- The Framebus OUT of the NetWave Slave (N) is not connected.
- The Framebus IN of the NetWave Master (L,+), NetWave Slave (N,-) muss be terminated with a Framebus Terminator.
- The Signal OUT1 of the NetWave Slave (N,-) is connected to the Signal IN2 of the NetWave Slave (N,-).
- Switch the PE at NetWave Slave (N, -) to ground.
- Each NetWave is supplied.
- The PC computer connected to the each NetWave.
- The NetWave Master (L1) is setup in the menu "Standalone/Master/Slave" to the mode "Standalone".

Standalone/Master/Slave Standalone The NetWave works as standalone device.

- The NetWave Slave (L2) is setup in the menu "Standalone/Master/Slave" to the mode "Standalone".

Standalone/Master/Slave Standalone The NetWave works as standalone device.

 The EUT is connected for Phase L or + to the NetWave Master (L, +) and for Phase N or - to the NetWave Slave (N,-).
 The PE from each NetWave could be connected.



2 NetWaves in Standalone



6.3. Changing Operating Mode Master / Slave



This feature is available for Firmware V7.03.00 and later only.

The NetWave must be in Standalone Mode to be able to change modes.

When ordered as Cascade Source or Multi Source system the NetWaves are preset by the factory to Master and Slave operating modes. In case one of the two options is installed in a later stage (retrofit), it is necessary to set change the operating mode. This is also the case when one of the NetWaves (Master, Slave 1 or Slave 2) is replaced by another NetWave.

Changing operating mode from Master to Slave



Changing operating mode from Slave to Master



Continue the instructions in chapter Error! Reference source not found. and Error! Reference source not fo und. to setup the system for MultiSource or CascadeSource configuration.

7. Technical data

7.1. 1-phase NetWave 3.x / 5 / 7.x

AC / DC Power sc	ource						
	NetWave	3/3.1/5/	7 / 7.1	NetWave 7.2 / 7.3			
Output voltage	0V – 300 V AC (RMS)			0V – 360 V AC (RMS)			
	0V - ±425	V DC		0V -	- ±500 V DC		
Output frequency	DC – 5 kH	lz					
Frequency accuracy,	100 ppm						
stability							
NetWave	3	3.1	5	7/7.1/7-2/7.3			
Output power AC	3.5 kVA	3 kVA	4.2 kVA	7-5 kVA			
Output power DC	4.5 kW	4.25 kW	4.2 kW	9 kW			
Output current	12 A	33 A	14 A	26 A	(RMS) continuous		
@ max. 300V AC	21 A	66 A	26 A	47 A	(RMS) short (max. 3s)		
	100 A	250 A	100 A	200 A	repetitive peak		
Output connector	Safety lab	plugs (4mr	m banana)				
Regulation							
Voltage sense	internal or	external, 4	wires				
Sense range	Uset ≥ 100 V ac or dc: ± 5% of line setting						
Distortion (THD)	Less than	0.5%	(50 Hz / 60	Hz)			
Output voltage	Better tha	Better than 0.1%					
Stability							
Output voltage	Better than 0.5% FS						
Accuracy							
Output Noise	< 110 mVrms < 50 V < 320 mVrms						
Max. compensable	5% of max	5% of max. nominal voltage					
drop on wires	.50/						
	<5%						
Current limiter stops	1 ^						
Current limiter steps	IA See chante	or O					
Current inniter range	See chapte	10					
		miter Range	20				
Protection		ant					
		perature					
	Over volta	ade mains	vlaque				
	Low volta	de mains	supply				
		<u></u>					
Waveform genera	tor						
Segment types DC		DC. Ramr	, Square Tr	iangle, Sawtooth	Sine, Sine sweep Sine ripple		

Segment types DC	DC, Ramp, Square, Triangle, Sawtooth, Sine, Sine sweep, Sine ripple,
	Exponent, Profile
Point signal DC	
Segment types AC	Sine (flat curve, flat RMS adapted), Sine sweep, Sine up/down, Modulation,
	Sine Dip, Sine unbalance, Sine step
	Overswing, Sweep on Sine, Harmonic, Interharmonic, Interharmonic step,
	Harmonic distortion
Segments with option Aircraft	Sine offset (dc offset to sine), Sine Switching
Point Period AC	Sine, Triangle, Harmonic/Interharmonic, Harmonic Distortion
Segment duration	Unlimited
Data file import	CSV or Excel

Measurements (option)					
Input channels	2 channels (Opt-1 NWB required)				
Input voltage ranges	25 V, 50 V, 100 V, 250 V and 500 V;				
	unipolar or bipolar				
Input current ranges	7 A, 15 A, 30 A, 50 A and 150 A; (set in software)				
	unipolar or bipolar				
Resolution	16 Bit				
Accuracy	Voltage better than 0.2% @50/60Hz, of selected range				
	Current better than 0.5% @50/60Hz, of selected range				
Frequency range	DC – 50 kHz				
Sampling rate (selectable)	5 S/s – 100 kS/s				
Memory	Min. 40 GB on Hard disk				
	File size max. 1 GByte				

Display and Controls	
Display	Text LCD 2 lines, 40 characters
LED indicators	Power On
	Active output channel
	Trigger
	Running status
	Functional status hard disk
Operation	6 function keys
	Test On : ON / OFF key for the power source
Trigger	2 inputs, 2 outputs
DUT monitoring	2 inputs, configurable
Signal output	Output Signal of internal arbitrary generator
	(available only on NetWave 7.3, 30.2 & 60.2)
Source Input	Input for external or internal arbitrary signal generator
	(available only on Netwave 7.3)
Control	
Computer	PC 104 computer
Computer	AMD Microprocessor 500 MHz
	256 MB RAM
Operating system	Linux, with Real time extension
DSP Signal processor	Motorola DSP 56303
v ,	
Interfaces	
	GPIB Address 130
	Ethernet
	USB (for Measure & Analyze NW-Board option)
	USB (for memory stick and ext. hard disc) I max. 500mA
	RS232 (input from DPA analyzer)
	Frame bus (internal system bus)
Environmental Hard disk	
Temperature	
operating	5 – 40°C
storage	-20 – 60°C
gradient	20°C / hour
Humidity	10% – 90% non-condensing
Vibration	4.00
Uperating	
Non-Operating	5.06
Snock Operating	22EC (2ma)
Non Operating	2200 (2115) 000C (1mp)
Non-Operating	

AMETEK CTs

NetWa	ave
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Safety design	per IEC 1010, EN 61	010		
Power supply	3 x 400 V ± 10%	(3P, N, PE)		
	3 x 208 V ± 10%	(3P, N, PE) optional		
line frequency	45 Hz – 65 Hz			
Input current max.				
- NetWave 3				
- NetWave 5				
- NetWave 7	16 A 3-phase, N + P	E (neutral max.27 A)	@ 3 x 400 V	
- NetWave 7-208	50 A with external m	atching transformer	3 x 208 V to	400 V
- NetWave 7-480	25 A with external m	atching transformer	3 x 480 V to	400 V
- NetWaye 7.3	25 A 3-phase + PE	-	@ 3 v 400 V	
- NetWave 7.3	$50 \land 3$ -phase + PE		@ 3 x 208 V	
- NetWave 7 3-480	21 A 3-phase + PE		@ 3 x 480 V	
	Control			(E x 20 mm)
Fuses				$(5 \times 20 \text{ mm})$
	AC 3 X 400/480 V	F2:25 A 500 V >12		$(10 \times 38 \text{ mm})$
	AC 3 x 208 V	F2:50 A 500 V >12	20 KA	(10 x 38 mm)
Input connector	CEE type 32 A			
	Terminal block 50 A			
Noise (NW operates)	54dB – A meas	ured 1m in front of the	device 1.5 m a	above ground



NetWave

7.2. 3-phase NetWave

AC / DC Power so	urce				
Output voltage	0V – 300 V	AC (RMS)			
	0V - ±425	V DC			
Output frequency	DC – 5 kH	z			
Frequency accuracy,	100 ppm				
stability		1	T		
NetWave	20	30	60	67	
Output power AC	22.5 kVA	30 kVA	60 kVA	67 kVA	
Output power DC	27 kW	36 kW	72 kW	72 kW	
Output current	26 A	33 A	66 A	75 A	(RMS) continuous
@ 300V AC	47 A	66 A	100 A	100 A	(RMS) short (max. 3s)
	200 A	250 A	400 A	400 A	repetitive peak
Output connector	32 A	32 A	63 A	63 A	CEE con. or Terminal
					Safety lab plugs (4/6mm banana)

7.2.1.3-phase NetWave 20, NetWave 30, NetWave 60, NetWave 67

7.2.2.3-phase NetWave 20.1, NetWave 30.1, NetWave 60.1

AC / DC Power so	urce			
Output voltage	0V – 360 V	AC (RMS)		
	0V - ±500	V DC		
Output frequency	DC – 5 kH	z		
Frequency accuracy,	100 ppm			
stability				
NetWave	20.1	30.1	60.1	
Output power AC	22.5 kVA	30 kVA	60 kVA	
Output power DC	27 kW	36 kW	72 kW	
Output current	26 A	33 A	66 A	(RMS) continuous
@ 300V AC	47 A	66 A	100 A	(RMS) short (max. 3s)
	200 A	250 A	400 A	repetitive peak
Output connector	32 A	32 A	63 A	CEE con. or Terminal
				Safety lab plugs (4/6mm banana)

7.2.3.3-phase NetWave 20.2, NetWave 30.2, NetWave 60.2, NetWave 67.2, NetWave 90.2

AC / DC Power source						
Output voltage	0V – 360 V	V AC (RMS)				
	0V - ±500	V DC				
Output frequency	DC – 5 kH	z				
Frequency accuracy,	100 ppm					
stability						
NetWave	20.2	30.2	60.2	67.2	90.2	
Output power AC	22.5 kVA	30 kVA	60 kVA	67 kVA	90 kVA	
Output power DC	27 kW	36 kW	72 kW	72 kW	110 kW	
Output current	26 A	33 A	66 A	75 A	100 A	(RMS) continuous
@ 300V AC	47 A	66 A	100 A	100 A	150 A	(RMS) short (max. 3s)
	200 A	250 A	400 A	400 A	500 A	repetitive peak
Output connector	32 A	32 A	63 A	63 A	100 A	CEE con. or Terminal
						Safety lab plugs
						(4/6mm banana)

7.2.4.3-phase NetWave 20.3/.5, NetWave 30.3/.5, NetWave 60.3/.5, NetWave 67.3/.5

AC / DC Power source						
Output voltage	0V – 400 V	V AC (RMS))			
	0V - ±560	V DC				
Output frequency	DC – 5 kH	z				
Frequency accuracy,	100 ppm					
stability						
NetWave	20.3/.5	30.3/.5	60.3/.5	67.3/.5		
Output power AC	22.5 kVA	30 kVA	60 kVA	67 kVA		
Output power DC	27 kW	36 kW	72 kW	72 kW		
Output current	26 A	33 A	66 A	75 A	(RMS) continuous	
@ 300V AC	47 A	66 A	100 A	100 A	(RMS) short (max. 3s)	
	200 A	250 A	400 A	400 A	repetitive peak	
Output connector	32 A	32 A	63 A	63 A	CEE con. or Terminal	
					Safety lab plugs (4/6mm banana)	

7.2.5.3-phase NetWave 90.3/.5, NetWave 108.3/.5

AC / DC Power so	urce		
Output voltage	0V – 400 V	V AC (RMS)	
	0V - ±560	V DC	
Output frequency	DC – 5`00	0 Hz	
Frequency accuracy,	100 ppm		
stability			
NetWave	90.3/.5	108.3/.5	
Output power AC	90 kVA	108 kVA	
Output power DC	110 kW	150 kW	
Output current	100 A	100 A	(RMS) continuous
@ 300V AC	150 A	150 A	(RMS) short (max. 3s)
	500 A	500 A	repetitive peak
Output connector	100 A	100 A	CEE con. or Terminal
			Safety lab plugs (4/6mm banana)

7.2.6.3-phase NetWave 30.4 (based on NetWave 30.3)

AC / DC Power sc	ource		
Output voltage	0V – 354V	AC (RMS)	
	0V - ±500 '	V DC	
	Output volt	age limited t	o max. 1000VDC (in HV-DC mode) by hardware.
Output frequency	DC – 5`000) Hz	
Frequency accuracy,	100 ppm		
stability		Γ	
NetWave	30.4		
Output power AC	30 kVA		
Output power DC	36 kW		
Output current	33 A		(RMS) continuous
@ 300V AC	66 A		(RMS) short (max. 3s)
	250 A		repetitive peak
Output connector	32 A		CEE con. or Terminal
			Safety lab plugs (4/6mm banana)

7.2.7.General technical data for all 3-phase NetWave

Voltage sense internal or external. 4 wires Sense range Uset 2 100 V ac of c2: 5% of line setting Distorion (THD) Less than 0.5% (for 50 Hz / 60 Hz) Output voltage Accuracy DC: ± 0.2 % of set value ± 0.15 % of full scale, AC: add ± 0.1 % of set frequency / 1000 Output voltage Output voltage Accuracy AC: add ± 0.1 % of set frequency / 1000 Max. compen. drop on wires 5% of max. nominal voltage Current limiter accuracy 45% Current limiter range See chapter 0 Current limiter range Current Ranges: Minimum current: 10 A Protection Over current Over current Over current <	Regulation	
Senser ange Uset 1:00 V ac or dc: ± 5% of line setting Distortion (THD) Less than 0.5% (of 50 V alue ± 0.15 % of full scale, Output voltage Stability Better than 0.1% Output voltage Stability Detter than 0.1% Output voltage stability See chapter 0 Current limiter range See chapter 0 Current limiter in parallel switching Current Ranges: Multiply this value by three when using Parallel switching Protection Over current Cover remportative Over voltage mains supply Low voltage mains supply Low voltage mains supply Low voltage mains supply Segment types DC Diff C, Rang, Square, Triangle, Sawooth, Step, Sine, Sine sweep, Sine Bine Dweell, Sine, Harmonic, Interharmonic, Interharmonic step, Harmonic distorion Segment types AC Sine (find curve, fint RMS dastpet(M doulation, Sine sweep, Sine Sine offset (do fiset to sine), Sine Dip, Sine Exponent Segment types AC Sine offset (do fiset to sine), Sine Dip, Sine Exponent	Voltage sense	internal or external, 4 wires
Distorion (THD) Less than 0.5% (for 50 Hz / 60 Hz) Output voltage Stability Better than 0.1% Output voltage Accuracy DC: ± 0.2 % of set value ± 0.15 % of full scale, AC: add ± 0.1% of set frequency / 1000 Output voltage Stability Better than 0.1% Max. compen drop on wires Set on the set of	Sense range	Uset ≥ 100 V ac or dc: ± 5% of line setting
Output voltage Stability Deter than 0.1% Output voltage Accuracy DC: ± 0.2 % of set value ± 0.15 % of full scale, AC: add ± 0.1 % of set frequency / 1000 Output Noise -500 / 10 mVrms; 500 / 300 Vrms +0.02% of set value Max. compen. drop on wires 5% of max. nominal voltage Current limiter accuracy -2% Current limiter accuracy -2% Current limiter range See chapter 0 Current limiter range See chapter 0 Current limiter range Current Ranges: Current limiter range See chapter 0 Parallel switching Current Range: Vor ustage mains supply Dover current Over current Over current Over voltage mains supply Low voltage mains supply Low voltage mains supply Supple, Profile, Square sweep, Noise, Sine Dweel, Sine Jane, Harmonic, Exponent. Segment types DC DC: Ramp, Square, Triangle, Sawtooth, Step, Sine sweep, Sine is now upid, Porfile, Square sweep, Noise, Sine Dweel, Sine, Harmonic, Linterharmonic step, Harmonic distoring Segment types AC Sine (filt curve, filt RMS dastpet() Modulation, Sine sweep, Sine sweep, OS ise and the stand of the stand stand stand stand stand stand s	Distortion (THD)	Less than 0.5% (for 50 Hz / 60 Hz)
Output voltage Accuracy DC: ± 0.2 % of set value ± 0.15 % of full scale, AC: add ± 0.1 % of set frequency / 1000 Output Noise <500: 110 mVms; ±50 V < 320 mVms ±0.02% of set value	Output voltage Stability	Better than 0.1%
AC: add ± 0.1% of set frequency / 1000 Output Noise <50V < 320 mVrms +0.02% of set value	Output voltage Accuracy	DC: ± 0.2 % of set value ± 0.15 % of full scale,
Output Noise <50V: 110 mVrms; 250 V ≤ 320 mVrms +0 02% of set value	1 0 ,	AC: add ± 0.1 % of set frequency / 1000
Max Comment S% of max. nominal voltage Current limiter accuracy <5%	Output Noise	<50V: 110 mVrms; ≥50 V < 320 mVrms +0.02% of set value
Current limiter accuracy <5%	Max. compen. drop on wires	5% of max. nominal voltage
Current limiter steps 1.A Current limiter range See chapter 0 Current limiter in parallel switching Current Ranges Current limiter in parallel switching Current Range: Protection Over current Over outrage mains supply Stew Rate 8 V / µs Phase Resolution 1° Waveform generator 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 (flat curve, flat RMS adapted), Modulation, Sine sweep, Sweep on Sine, Sine up/down, Sine unbalance, Sine Offset, Sine Sweep on Sine, Sine up/down, Sine unbalance, Sine Offset, Sine Sweep on Sine, Sine up/down, Sine unbalance, Sine Offset, Sine Sweep on Sine, Sine up/down, Sine Unbalance, Sine Offset, Sine Sweep on Sine, Sine up/down, Sine Unbalance, Sine Offset, Sine Sweep on Sine, Sine up/down, Sine Unbalance, Sine Offset, Sine Sweep on Sine, Sine up/down, Sine Unbalance, Sine Offset, Sine Sweep on Sine, Sine up/down, Sine Unbalance, Sine Offset, Sine Sweep on Sine, Sine up/down, Sine Unbalance, Sine Offset, Sine Sweep on Sine, Sine up/down, Sine Unbalance, Sine Offset, Sine Sweep on Sine, Sine Up/down, Sine Unbalance, Sine Offset, Sine Sweep on Sine, Sine up/down, Sine Unbalance, Sine Offset, Sine Sweep on Corrent. Segment duration Unlimited Data flie import CSV or Excel Measurements (option) functor of polar	Current limiter accuracy	<5%
Current limiter range See chapter 0 Current limiter in parallel switching Current Ranges Protection Over current Over current Over current Over outlage mains supply Silew Rate Phase Resolution 1° Waveform generator Silew Rate Segment types DC DC, Ramp, Square, Triangle, Sawtooth, Step, Sine, Sine sweep, Sine Dwell, Sinc, Harmonic, Exponent Sine Offset, Sine, Sine sweep, Sine Dwell, Sine, Marmonic, Interharmonic, Interharmonic step, Harmonic distortion Segment types AC Sine offset (dc offset to sine), Sine Dip, Sine Exponent Begment duration Unlimited Data file import CSV or Excel Measurements (option) Input channels Input channels 6 channels 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar Input current ranges 10 A, 25 A, 50 A, 100 A and 220 A; Unpolar or bipolar Input current (selectable) Segmen	Current limiter steps	1 A
Current Limiter Ranges Current limiter in parallel switching Current Range: Multiply this value by three when using Protection Over current Over voltage mains supply Description Segment System 8 V / µs Phase Resolution 1° Waveform generator DC, Ramp, Square, Triangle, Sawtooth, Step, Sine, Sine sweep, Sine ramp, Damped sinewave, Sine ripple, Profile, Square sweep, Noise, Sine ramp, Damped sinewave, Sine ripple, Profile, Square sweep, Noise, Sine ramp, Damped sinewave, Sine ripple, Profile, Square sweep, Noise, Sine Dwell, Sinc, Harmonic, Exponent. Segment types AC Sine (flat curve, flat RMS adapted), Moculation, Sine sweep, Sweep on Sine, Sine up/down, Sine ubalance, Sine Offset, Sine Switching, Over Swing, Harmonic, Interharmonic, Interharmonic step, Harmoric distortion Segments with option Aircraft Sine offset (dc offset to sine), Sine Dip, Sine Exponent Unlimited Data file import CSV or Excel Measurements (option) Input channels 6 channels (Opt-3 NWB required) Input current ranges 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar Input current ranges 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar Input current ranges 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar Resolution 16 Bit Accuracy	Current limiter range	See chapter 0
Current Limiter Nanges Current Tanges Current Tanges Protection Over current Segment types AC Sine offset (dc offset to sine), Sine balance, Sine offset, Sine Side up/down, Sine unbalance, Sin		
Current limiter in parallel switching Minimum current: 10 A Current Range: Multiply this value by three when using Parallel Switching on 3 Phases models Protection Over current Over voltage mains supply Segment vpes DC DC, Ramp, Square, Triangle, Sawtooth, Step, Sine, Sine sweep, Sine armo, Damped sinewave, Sine ripple, Profile, Square sweep, Noise, Sine Dwell, Sinc, Harmonic, Exponent Segment types DC DC, Ramp, Square, Triangle, Sawtooth, Step, Sine, Sine sweep, Sine armo, Damped sinewave, Sine ripple, Profile, Square sweep, Noise, Sine Dwell, Sinc, Harmonic, Exponent Segment types AC Sine (Fat curve, flat RMS adapted), Modulation, Sine sweep, Sweep on Sine, Sine unbalance, Sine Offset, Sine Sweep on Sine, Sine unbalance, Sine Offset, Sine Sweep on Sine, Sine unbalance, Sine Offset, Sine Sweep on Sine, Sine Undistortion Segment types AC Sine offset (dc offset to sine), Sine Dip, Sine Exponent Unlimited Data file import CSV or Excel Measurements (option) Input current ranges Input current ranges 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar Resolution 16 B if Accuracy Voltage: ± 0.05 % of reading ± 0.2 % of range Current: ± 0.2 % of reading ± 0.2 % of range Current: ± 0.2 % of reading ± 0.3 % of range Frequency range DC - 100 kHz Sampling rate (selectable) 5 Sis – 500 kS/s Memory		Current Limiter Ranges
parallel switching Current Range: Multiply this value by three when using Parallel Switching on 3 Phases models Protection Over current Over voltage mains supply Dever voltage mains supply Slew Rate 8 V / µs Phase Resolution 1* Waveform generator Segment types DC Segment types DC DC, Ramp, Square, Triangle, Sawtooth, Step, Sine sweep, Sine Tipple, Profile, Square sweep, Noise, Sine Dwell, Sinc, Harmonic, Exponent Segment types AC Sine (flat Curve, flat RMS adapted), Modulation, Sine sweep, Sweep on Sine, Sine up/down, Sine unbalance, Sine Offset, Sine Switching, Over Swing, Harmonic, Interharmonic step, Harmonic distortion Segments with option Aircraft Sine offset (dc offset to sine), Sine Dip, Sine Exponent Segments with option Aircraft Sine offset (dc offset to sine), Sine Dip, Sine Exponent Segment duration Unlimited Data file import CSV or Excel Measurements (option) Input channels Input current ranges 25 V, 50 V, 100 V, 250 V and 600V (old systems 550 V) ; unipolar or bipolar Input current ranges 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar Resolution 16 Bit Accuracy Voltage: ± 0.05 % of reading ± 0.2 % of range Current: ± 0.2 % of reading ± 0.3 % of range	Current limiter in	Minimum current: 10 A
Parallel Switching on 3 Phases models Protection Over current Over voltage mains supply Low voltage mains supply Slew Rate 8 V / µs Phase Resolution 1° Waveform generator Segment types DC 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, Leyponent Segment types AC Sine (flat curve, flat RMS adapted), Modulation, Sine sweep, Sweep on Sine, Sine up/down, Sine unbalance, Sine Offset, Sine Switching, Over Swing, Harmonic, Interharmonic step, Harmonic distortion Segment swith option Aircraft Sine offset (d offset to sine), Sine Dip, Sine Exponent Unlimited Data file import Segment duration Unlimited Data file import CSV or Excel Measurements (option) Input channels Input current ranges 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar Input current ranges 0 C - 100 kHz Sampling rate (selectable) 5 S's – 500 K%s Memory Min. 40GB on Hard disk File size max. 1 GByte Display and Controls Power On Active output channel Trigger 2 inputs, 2 outputs	parallel switching	Current Range: Multiply this value by three when using
Protection Over current Over voltage mains supply Low voltage mains supply Slew Rate 8 V / µs Phase Resolution 1* Waveform generator Sime ramp, Damped sinewave, Sine ripple, Profile, Square sweep, Noise, Sine Dwell, Sinc, Harmonic, Exponent Segment types DC DC, Ramp, Square, Triangle, Sawtooth, Step, Sine, Sine sweep, Sine Dwell, Sinc, Harmonic, Exponent Segment types AC Sine (flat curve, flat RMS adapted), Modulation, Sine sweep, Sweep on Sine, Sine up/down, Sine unbalance, Sine Offset, Sine Switching, Over Swing, Harmonic, Interharmonic step, Harmonic distortion Segments with option Aircraft Sine offset (dc offset to sine), Sine Dip, Sine Exponent Data file import CSV or Excel Measurements (option) Input channels Input channels 6 channels< (Opt-3 NWB required)		Parallel Switching on 3 Phases models
Over temperature Over voltage mains supply Slew Rate 8 V / µs Phase Resolution 1° Waveform generator Segment types DC 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 (flat curve, flat RMS adapted), Modulation, Sine sweep, Sweep on Sine, Sine up/down, Sine unbalance, Sine Offset, Sine Switching, Over Swing, Harmonic, Interharmonic, Interharmonic step, Harmonic distortion Segments with option Aircraft Sine offset (offset to sine), Sine Dip, Sine Exponent Unlimited Unlimited Data file import CSV or Excel Measurements (option) 6 channels (Opt-3 NWB required) Input channels 6 channels (Opt-3 NWB required) Input current ranges 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar Resolution 16 Bit Accuracy Voltage: ± 0.05 % of reading ± 0.2 % of range Current ± 0.2 % of range CC – 100 kHz Sampling rate (selectable) 5 S/s – 500 K3/s Memory Min. 40GB on Hard disk File size max. 1 GByte Display Text LCD 2 lines, 40 characters <tr< td=""><td>Protection</td><td>Over current</td></tr<>	Protection	Over current
Over voltage mains supply Low voltage mains supply Slew Rate 8 V / µs Phase Resolution 1° Waveform generator DC, Ramp, Square, Triangle, Sawtooth, Step, Sine, Sine sweep, Sine ramp, Damped sinewave, Sine ripple, Profile, Square sweep, Noise, Sine f flat curve, flat RMS adapted), Modulation, Sine sweep, Sweep on Sine, Sine up/down, Sine unbalance, Sine Offset, Sine Switching, Over Swing, Harmonic, Interharmonic, Interharmonic step, Harmonic distortion Segments with option Aircraft Sine offset (dc offset to sine), Sine Exponent Segment swith option Aircraft Sine offset (dc offset to sine), Sine Exponent Segment swith option Aircraft Sine offset (dc offset to sine), Sine Exponent Segment swith option Aircraft Sine offset (dc offset to sine), Sine Exponent Segment swith option Aircraft Sine offset (dc offset to sine), Sine Dip, Sine Exponent Segment swith option Aircraft Sine offset (dc offset to sine), Sine Dip, Sine Exponent Segment science Unipolar or bipolar Input channels 6 channels (Opt-3 NWB required) Input current ranges 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar Resolution 16 Bit Accuracy Voltage: ±0.05 % of reading ±0.2 % of range Current: ±0.2 % of reading ±0.2		Over temperature
Low voltage mains supply Slew Rate 8 V / µs Phase Resolution 1° Waveform generator Segment types DC 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 (flat curve, flat RMS adapted), Modulation, Sine sweep, Sweep on Sine, Sine up/down, Sine unbalance, Sine Offset, Sine Switching, Over Swing, Harmonic, Interharmonic step, Harmonic distortion Segments with option Aircraft Sine offset (coffset to sine), Sine Dip, Sine Exponent Segment duration Unlimited Data file import CSV or Excel Measurements (option) 6 channels (Opt-3 NWB required) Input voltage ranges 25 V, 50 V, 100 V, 250 V and 600V (old systems 550 V) ; unipolar or bipolar Input voltage ranges 25 V, 50 V, 100 V, 250 V and 600V (old systems 550 V) ; unipolar or bipolar Resolution 16 Bit Accuracy Voltage: ± 0.05 % of reading ± 0.2 % of range Current: ± 0.2 % of reading ± 0.3 % of range Frequency range DC - 100 kHz Sampling rate (selectable) 5 S's – 500 kS/s Memory Min. 40GB on Hard disk Flie size max. 1 GByte		Over voltage mains supply
Slew Rate 8 V / µs Phase Resolution 1° Waveform generator Segment types DC 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 (flat curve, flat RMS adapted), Modulation, Sine sweep, Sweep on Sine, Sine up/down, Sine unbalance, Sine Offset, Sine Switching, Over Swing, Harmonic, Interharmonic, Interharmonic step, Harmonic distortion Segments with option Aircraft Sine offset (dc offset to sine), Sine Dip, Sine Exponent Segment duration Unlimited Data file import CSV or Excel Measurements (option) 6 channels (Opt-3 NWB required) Input current ranges 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar Input current ranges 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar Resolution 16 Bit Accuracy Voltage: ± 0.25 % of reading ± 0.2 % of range Current: ± 0.2 % of reading ± 0.2 % of range Current: ± 0.2 % of reading ± 0.2 % of range Dec - 100 kHz Sampling rate (selectable) 5 S/s – 500 kS/s Memory Min. 40GB on Hard disk File size max. 1 GBy		Low voltage mains supply
Phase Resolution 1° Waveform generator Segment types DC DC, Ramp, Square, Triangle, Sawtooth, Step, Sine, Sine sweep, Noise, Sine Dwell, Sinc, Harmonic, Exponent Segment types AC Sine (Ital curve, Ital RMS adapted), Modulation, Sine sweep, Sweep on Sine, Sine up/down, Sine unbalance, Sine Offset, Sine Switching, Over Swing, Harmonic, Interharmonic, Interharmonic step, Harmonic distortion Segments with option Aircraft Sine offset (do offset to sine), Sine Dip, Sine Exponent Segment duration Unlimited Data file import CSV or Excel Measurements (option) Input channels Input channels 6 channels (Opt-3 NWB required) Input current ranges 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar Resolution 16 Bit Accuracy Voltage: ±0.05 % of reading ± 0.2 % of range Current: ±0.2 % of reading ± 0.3 % of range Frequency range DC - 100 kHz Sampling rate (selectable) 5 S/s - 500 kS/s Memory Min. 40GB on Hard disk File size max. 1 GByte Display Text LCD 2 lines, 40 characters LED indicators Power On Active output channel Trigger Running status	Slew Rate	8 V / µs
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 (flat curve, flat RMS adapted), Modulation, Sine sweep, Sweep on Sine, Sine up/down, Sine unbalance, Sine Offset, Sine Switching, Over Swing, Harmonic, Interharmonic, Interharmonic step, Harmonic distortion Segments with option Aircraft Sine offset (dc offset to sine), Sine Dip, Sine Exponent Segment duration Unlimited Data file import CSV or Excel Measurements (option) Input channels Input channels 6 channels (Opt-3 NWB required) Input ourge ranges 10 A, 25 A, 50 A, 100 A, 200 A and 200 A; unipolar or bipolar Input current ranges 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar Resolution 16 Bit Accuracy Voltage: ± 0.05 % of reading ± 0.2 % of range Current: ± 0.2 % of reading ± 0.3 % of range Frequency range DC - 100 kHz Sampling rate (selectable) 5 S/s - 500 kS/s Memory Min. 40GB on Hard disk File size max. 1 GByte Display Text LCD 2 lines, 40 characters LED indicators Power On Ru	Phase	Resolution 1°
Weetorm 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 (flat curve, flat RMS adapted), Modulation, Sine sweep, Sweep on Sine, Sine up/down, Sine unbalance, Sine Offset, Sine Switching, Over Swing, Harmonic, Interharmonic, Interharmonic step, Harmonic distortion Segments with option Aircraft Sine offset (dc offset to sine), Sine Dip, Sine Exponent Data file import CSV or Excel Measurements (option) Input channels Input current ranges 0 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar Input current ranges 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar Resolution 16 Bit Accuracy Voltage: ± 0.05 % of reading ± 0.3 % of range Frequency range DC - 100 KHz Sampling rate (selectable) 5 S/s = 500 KS/s Memory Min. 40GB on Hard disk Frie size max. 1 GByte Display and Controls Power On Active output channel Display Text LCD 2 lines, 40 characters LED indicators Power On Active output channel Fringer 6 function keys Trigger		
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 (flat curve, flat RMS adapted), Modulation, Sine sweep, Sweep on Sine, Sine up/down, Sine unbalance, Sine Offset, Sine Sweep on Sine, Sine up/down, Sine unbalance, Sine Offset, Sine Sweep on Sine, Sine up/down, Sine unbalance, Sine Offset, Sine Segments with option Aircraft Segments with option Aircraft Sine offset (dc offset to sine), Sine Dip, Sine Exponent Segment duration Unlimited Data file import CSV or Excel Measurements (option) 6 channels (Opt-3 NWB required) Input channels 6 channels (Opt-3 NWB required) Input outage ranges 25 V, 50 V, 100 V, 250 V and 600V (old systems 550 V); unipolar or bipolar Input current ranges 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar Resolution 16 Bit Accuracy Voltage: ± 0.05 % of reading ± 0.2 % of range Current: ± 0.2 % of reading ± 0.3 % of range Frequency range DC - 100 KHz Sampling rate (selectable) 5 S/s - 500 KS/s Memory Text LCD 2 lines, 40 characters LED indicators Power On Active output channel Trigger Running status Functional st	Waveform generator	
Sine ramp, Damped sinewave, Sine ripple, Square sweep, Noise, Sine Dwell, Sinc, Harmonic, Exponent Segment types AC Sine (flat curve, flat RMS adapted), Modulation, Sine sweep, Sweep on Sine, Sine up/down, Sine unbalance, Sine Offset, Sine Switching, Over Swing, Harmonic, Interharmonic, Interharmonic step, Harmonic distortion Segments with option Aircraft Sine offset (dc offset to sine), Sine Dip, Sine Exponent Segment duration Unlimited Data file import CSV or Excel Measurements (option) Input channels Input channels 6 channels 0 channels 6 channels 1 nput voltage ranges 25 V, 50 V, 100 V, 250 V and 600V (old systems 550 V); unipolar or bipolar Input current ranges 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar Resolution 16 Bit Accuracy Voltage: ± 0.05 % of reading ± 0.2 % of range Current: ± 0.2 % of reading ± 0.3 % of range Frequency range DC - 100 KHz Sampling rate (selectable) 5% - 500 K/s Memory Min. 40GB on Hard disk File size max. 1 GByte Display and Controls Display and Controls Power On Active output channel Trigger Running status hard disk	Segment types DC	DC, Ramp, Square, Triangle, Sawtooth, Step, Sine, Sine sweep,
Sine Dwell, Sinc, Harmonic, Exponent Segment types AC Sine (flat curve, flat RMS adapted), Modulation, Sine sweep, Sweep on Sine, Sine up/down, Sine unbalance, Sine Offset, Sine Switching, Over Swing, Harmonic, Interharmonic, Interharmonic step, Harmonic distortion Segments with option Aircraft Sine offset (dc offset to sine), Sine Dip, Sine Exponent Segment duration Unlimited Data file import CSV or Excel Measurements (option) Input channels Input channels 6 channels (Opt-3 NWB required) Input channels 6 channels (Opt-3 NWB required) Input current ranges 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar Input current ranges 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar Accuracy Voltage: ± 0.05 % of reading ± 0.2 % of range Current: ± 0.2 % of reading ± 0.3 % of range Frequency range DC - 100 KHz Sampling rate (selectable) 5 S/s - 500 KS/s Menory Min. 40GB on Hard disk File size max. 1 GByte Display and Controls Power On Active output channel Trigger Running status Functional status hard disk Operation 6 function keys Test On : ON / OFF key for the power source Inputs & Outputs 2 inputs, 2 outputs		Sine ramp, Damped sinewave, Sine ripple, Profile, Square sweep, Noise,
Segment types AC Sine (flat curve, flat RMS adapted), Modulation, Sine sweep, Sweep on Sine, Sine up/down, Sine unbalance, Sine Offset, Sine Sweep on Sine, Sine up/down, Sine unbalance, Sine Offset, Sine Segments with option Aircraft Segment duration Unlimited Data file import CSV or Excel Measurements (option) Input channels Input channels 6 channels (Opt-3 NWB required) Input voltage ranges 25 V, 50 V, 100 V, 250 V and 600V (old systems 550 V); unipolar or bipolar Input current ranges 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar Resolution 16 Bit Accuracy Voltage: ± 0.05 % of reading ± 0.2 % of range Current: ± 0.2 % of reading ± 0.3 % of range Frequency range DC - 100 kHz Sampling rate (selectable) 5 S/s - 500 kS/s Memory Min. 40GB on Hard disk File size max. 1 GByte Display and Controls Power On LED indicators Power On Active output channel Trigger Running status Functional status hard disk Operation 6 function keys Test On : ON / OFF key for the power source Trigger		Sine Dwell, Sinc, Harmonic, Exponent
Sweep on Sine, Sine up/down, Sine unbalance, Sine Offset, Sine Switching, Over Swing, Harmonic, Interharmonic, Interharmonic step, Harmonic distortion Segments with option Aircraft Sine offset (dc offset to sine), Sine Dip, Sine Exponent Unlimited Unlimited Data file import CSV or Excel Measurements (option) 6 channels Input onlage ranges 25 V, 50 V, 100 V, 250 V and 600V (old systems 550 V) ; unipolar or bipolar Input outrent ranges 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar Resolution 16 Bit Accuracy Voltage: ± 0.05 % of reading ± 0.2 % of range Current: ± 0.2 % of reading ± 0.3 % of range DC - 100 kHz Sampling rate (selectable) 5 S/s – 500 kS/s Memory Min. 40GB on Hard disk File size max. 1 GByte Display and Controls Display Text LCD 2 lines, 40 characters LED indicators Power On Active output channel Trigger Running status Functional status hard disk Functional status hard disk 6 function keys Test On : ON / OFF key for the power source Test On : ON / OFF key for the power source	Segment types AC	Sine (flat curve, flat RMS adapted), Modulation, Sine sweep,
Segments with option Aircraft Sine offset (dc offset to sine), Sine Dip, Sine Exponent Segment duration Unlimited Data file import CSV or Excel Measurements (option) Input channels 6 channels (Opt-3 NWB required) Input channels 6 channels (Opt-3 NWB required) Input current ranges 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar Input current ranges 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar Resolution 16 Bit Accuracy Voltage: ± 0.2 % of reading ± 0.2 % of range Current: ± 0.2 % of reading ± 0.3 % of range Drequency range DC - 100 kHz Sampling rate (selectable) 5 S/s - 500 kS/s Mernory Min. 40GB on Hard disk File size max. 1 GByte Display Text LCD 2 lines, 40 characters LED indicators Power On Active output channel Trigger Functional status hard disk Operation 6 function keys Test On : ON / OFF key for the power source		Sweep on Sine, Sine up/down, Sine unbalance, Sine Offset, Sine
Segments with option Aircraft Sine offset (dc offset to sine), Sine Dip, Sine Exponent Segment duration Unlimited Data file import CSV or Excel Measurements (option) Input channels Input channels 6 channels (Opt-3 NWB required) Input voltage ranges 25 V, 50 V, 100 V, 250 V and 600V (old systems 550 V) ; unipolar or bipolar Input current ranges 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar Resolution 16 Bit Accuracy Voltage: ± 0.05 % of reading ± 0.2 % of range Current: ± 0.2 % of reading ± 0.3 % of range Frequency range DC – 100 kHz Sampling rate (selectable) 5 S/s – 500 kS/s Memory Min. 40GB on Hard disk File size max. 1 GByte Display and Controls Display LED indicators Power On Active output channel Trigger Running status Functional status hard disk Operation 6 function keys Test On : ON / OFF key for the power source Inputs & Outputs 2 inputs, 2 outputs		Switching, Over Swing, Harmonic, Internarmonic, Internarmonic step,
Segment duration Unlimited Data file import CSV or Excel Measurements (option) Input channels 6 channels (Opt-3 NWB required) Input channels 6 channels (Opt-3 NWB required) Input current ranges 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar Input current ranges 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar Resolution 16 Bit Accuracy Voltage: ± 0.05 % of reading ± 0.2 % of range Current: ± 0.2 % of reading ± 0.3 % of range Frequency range DC - 100 kHz Sampling rate (selectable) 5 S/s - 500 kS/s Memory Min. 40GB on Hard disk File size max. 1 GByte Display Text LCD 2 lines, 40 characters LED indicators Power On Active output channel Trigger Running status Functional status hard disk Operation 6 function keys Test On : ON / OFF key for the power source	Cognosta with option Aircraft	Harmonic distortion
Segment duration Onlimited Data file import CSV or Excel Measurements (option) Input channels 6 channels (Opt-3 NWB required) Input voltage ranges 25 V, 50 V, 100 V, 250 V and 600V (old systems 550 V); unipolar or bipolar Input current ranges 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar Resolution 16 Bit Accuracy Voltage: ± 0.05 % of reading ± 0.2 % of range Current: ± 0.2 % of reading ± 0.3 % of range Frequency range DC - 100 kHz Sampling rate (selectable) 5 S/s - 500 kS/s Memory Min. 40GB on Hard disk File size max. 1 GByte Display Display Text LCD 2 lines, 40 characters LED indicators Power On Active output channel Trigger Running status Functional status hard disk Operation 6 function keys Test On : ON / OFF key for the power source Input contion keys Test On : ON / OFF key for the power source Input soutput sout	. / \/ \/ \/ \/ \/ \/ \/ \/ \/ \/ \/ \/ \	
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Input voltage ranges 25 V, 30 V, 100 V, 250 V and 600V (old systems 550 V), unipolar or bipolar Input current ranges 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar Resolution 16 Bit Accuracy Voltage: ± 0.05 % of reading ± 0.2 % of range Current: ± 0.2 % of reading ± 0.3 % of range Frequency range DC - 100 kHz Sampling rate (selectable) 5 S/s - 500 kS/s Memory Min. 40GB on Hard disk File size max. 1 GByte Display and Controls Display Display Text LCD 2 lines, 40 characters LED indicators Power On Active output channel Trigger Running status Functional status hard disk Operation 6 function keys Test On : ON / OFF key for the power source Inputs & Outputs 2 inputs, 2 outputs	Segment duration Data file import Measurements (option)	Unlimited CSV or Excel
Input current ranges 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar Resolution 16 Bit Accuracy Voltage: ± 0.05 % of reading ± 0.2 % of range Current: ± 0.2 % of reading ± 0.3 % of range Frequency range DC - 100 kHz Sampling rate (selectable) 5 S/s - 500 kS/s Memory Min. 40GB on Hard disk File size max. 1 GByte Display and Controls Display Display Text LCD 2 lines, 40 characters LED indicators Power On Active output channel Trigger Running status Functional status hard disk Operation 6 function keys Test On : ON / OFF key for the power source Inputs & Outputs 2 inputs, 2 outputs	Segments with option Aircraft Segment duration Data file import Measurements (option) Input channels	Onle onset (de onset to sine), one Exponent Unlimited CSV or Excel 6 channels (Opt-3 NWB required) 25 V 50 V 400 V 250 V and 600V (ald aveterna 550 V) ;
Input current ranges Ito A, 20 A, 100 A and 220 A, unipolar Resolution 16 Bit Accuracy Voltage: ± 0.05 % of reading ± 0.2 % of range Current: ± 0.2 % of reading ± 0.3 % of range DC - 100 kHz Sampling rate (selectable) 5 S/s - 500 kS/s Memory Min. 40GB on Hard disk File size max. 1 GByte Display and Controls Display Text LCD 2 lines, 40 characters LED indicators Power On Active output channel Trigger Running status Functional status hard disk Operation 6 function keys Test On : ON / OFF key for the power source Inputs & Outputs Trigger	Segment duration Data file import Measurements (option) Input channels Input voltage ranges	Once onset (de onset to sine), once Dip, once Exponent Unlimited CSV or Excel 6 channels (Opt-3 NWB required) 25 V, 50 V, 100 V, 250 V and 600V (old systems 550 V) ; unpolar or bipolar
Resolution 16 Bit Accuracy Voltage: ± 0.05 % of reading ± 0.2 % of range Errequency range DC - 100 kHz Sampling rate (selectable) 5 S/s - 500 kS/s Memory Min. 40GB on Hard disk File size max. 1 GByte Display and Controls Display Text LCD 2 lines, 40 characters LED indicators Power On Active output channel Trigger Running status Functional status hard disk 6 function keys Test On : ON / OFF key for the power source	Segment swith option Aircraft Segment duration Data file import Measurements (option) Input channels Input voltage ranges	6 channels (Opt-3 NWB required) 25 V, 50 V, 100 V, 250 V and 600V (old systems 550 V) ; unipolar or bipolar
Accuracy Voltage: ± 0.05 % of reading ± 0.2 % of range Current: ± 0.2 % of reading ± 0.3 % of range DC - 100 kHz Sampling rate (selectable) 5 S/s - 500 kS/s Memory Min. 40GB on Hard disk File size max. 1 GByte Display and Controls Display Text LCD 2 lines, 40 characters LED indicators Power On Active output channel Trigger Running status Functional status hard disk Operation 6 function keys Test On : ON / OFF key for the power source Inputs & Outputs Trigger 2 inputs, 2 outputs	Segments with option Aircraft Segment duration Data file import Measurements (option) Input channels Input voltage ranges Input current ranges	6 channels (Opt-3 NWB required) 25 V, 50 V, 100 V, 250 V and 600V (old systems 550 V) ; unipolar or bipolar 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar
Accuracy Current: ± 0.2 % of reading ± 0.2 % of range Current: ± 0.2 % of reading ± 0.3 % of range Current: ± 0.2 % of reading ± 0.3 % of range Frequency range DC – 100 kHz Sampling rate (selectable) 5 S/s – 500 kS/s Memory Min. 40GB on Hard disk File size max. 1 GByte Display and Controls Display Text LCD 2 lines, 40 characters LED indicators Power On Active output channel Trigger Running status Functional status hard disk Operation 6 function keys Test On : ON / OFF key for the power source Inputs & Outputs Trigger 2 inputs, 2 outputs	Segments with option Aircraft Segment duration Data file import Measurements (option) Input channels Input voltage ranges Input current ranges Resolution	6 channels (Opt-3 NWB required) 25 V, 50 V, 100 V, 250 V and 600V (old systems 550 V) ; unipolar or bipolar 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar 16 Bit
Frequency range DC - 100 kHz Sampling rate (selectable) 5 S/s - 500 kS/s Memory Min. 40GB on Hard disk File size max. 1 GByte Display and Controls Display Display Text LCD 2 lines, 40 characters LED indicators Power On Active output channel Trigger Running status Functional status hard disk Operation 6 function keys Test On : ON / OFF key for the power source Inputs & Outputs Trigger 2 inputs, 2 outputs	Segments with option Aircraft Segment duration Data file import Measurements (option) Input channels Input voltage ranges Input current ranges Resolution	Onle onset (de onset to sine), one Exponent Unlimited CSV or Excel 6 channels (Opt-3 NWB required) 25 V, 50 V, 100 V, 250 V and 600V (old systems 550 V) ; unipolar or bipolar 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar 16 Bit Voltage: ± 0.05 % of reading ± 0.2 % of range
Sampling rate (selectable) 5 S/s - 500 kS/s Memory Min. 40GB on Hard disk File size max. 1 GByte Display and Controls E Display Text LCD 2 lines, 40 characters LED indicators Power On Active output channel Trigger Running status Functional status hard disk Operation 6 function keys Test On : ON / OFF key for the power source Inputs & Outputs Trigger 2 inputs, 2 outputs	Segments with option Aircraft Segment duration Data file import Measurements (option) Input channels Input voltage ranges Input current ranges Resolution Accuracy	Onle onset (de onset to sine), one Exponent Unlimited CSV or Excel 6 channels (Opt-3 NWB required) 25 V, 50 V, 100 V, 250 V and 600V (old systems 550 V); unipolar or bipolar 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar 16 Bit Voltage: ± 0.05 % of reading ± 0.2 % of range Current: ± 0.2 % of reading ± 0.3 % of range
Memory Display and Controls Display and Controls Text LCD 2 lines, 40 characters LED indicators Power On Active output channel Trigger Running status Functional status hard disk Operation 6 function keys Test On : ON / OFF key for the power source Inputs & Outputs Trigger 2 inputs, 2 outputs	Segments with option Anctait Segment duration Data file import Measurements (option) Input channels Input voltage ranges Input current ranges Resolution Accuracy Erequency range	Once onset (ac onset to sine), once Dip, once ExponentUnlimitedCSV or Excel6 channels (Opt-3 NWB required)25 V, 50 V, 100 V, 250 V and 600V (old systems 550 V);unipolar or bipolar10 A, 25 A, 50 A, 100 A and 220 A;unipolar or bipolar16 BitVoltage: ± 0.05 % of reading ± 0.2 % of rangeCurrent: ± 0.2 % of reading ± 0.3 % of rangeDC = 100 kHz
Immu Sob of information File size max. 1 GByte Display and Controls Display Text LCD 2 lines, 40 characters LED indicators Power On Active output channel Trigger Running status Functional status hard disk Operation 6 function keys Test On : ON / OFF key for the power source Inputs & Outputs Trigger 2 inputs, 2 outputs	Segments with option Aircraft Segment duration Data file import Measurements (option) Input channels Input voltage ranges Input current ranges Resolution Accuracy Frequency range Sampling rate (selectable)	Gine biser (ac biser to sine), bine bip, bine ExponentUnlimitedCSV or Excel6 channels (Opt-3 NWB required)25 V, 50 V, 100 V, 250 V and 600V (old systems 550 V);unipolar or bipolar10 A, 25 A, 50 A, 100 A and 220 A;unipolar or bipolar16 BitVoltage: ± 0.05 % of reading ± 0.2 % of rangeDC - 100 kHz5 S/s - 500 kS/s
Display and Controls Display Text LCD 2 lines, 40 characters LED indicators Power On Active output channel Trigger Running status Functional status hard disk Operation 6 function keys Test On : ON / OFF key for the power source Inputs & Outputs Trigger 2 inputs, 2 outputs	Segments with option Aircraft Segment duration Data file import Measurements (option) Input channels Input voltage ranges Input current ranges Resolution Accuracy Frequency range Sampling rate (selectable) Memory	Once onset (ac onset to sine), one ExponentUnlimitedCSV or Excel6 channels (Opt-3 NWB required)25 V, 50 V, 100 V, 250 V and 600V (old systems 550 V) ; unipolar or bipolar10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar16 BitVoltage: ± 0.05 % of reading ± 0.2 % of range Current: ± 0.2 % of reading ± 0.3 % of rangeDC - 100 kHz5 S/s - 500 kS/sMin. 40GB on Hard disk
Display and Controls Display Text LCD 2 lines, 40 characters LED indicators Power On Active output channel Trigger Running status Functional status hard disk Operation 6 function keys Test On : ON / OFF key for the power source Inputs & Outputs Trigger 2 inputs, 2 outputs	Segments with option Aircraft Segment duration Data file import Measurements (option) Input channels Input voltage ranges Input current ranges Resolution Accuracy Frequency range Sampling rate (selectable) Memory	Once onset (ac onset to sine), once Dip, once ExponentUnlimitedCSV or Excel6 channels (Opt-3 NWB required)25 V, 50 V, 100 V, 250 V and 600V (old systems 550 V) ;unipolar or bipolar10 A, 25 A, 50 A, 100 A and 220 A;unipolar or bipolar16 BitVoltage: ± 0.05 % of reading ± 0.2 % of rangeCurrent: ± 0.2 % of reading ± 0.3 % of rangeDC - 100 kHz5 S/s - 500 kS/sMin. 40GB on Hard diskFile size max. 1 GByte
Display Text LCD 2 lines, 40 characters LED indicators Power On Active output channel Trigger Trigger Running status Functional status hard disk Functional status hard disk Operation 6 function keys Test On : ON / OFF key for the power source Inputs & Outputs Trigger 2 inputs, 2 outputs	Segments with option Aircraft Segment duration Data file import Measurements (option) Input channels Input voltage ranges Input current ranges Resolution Accuracy Frequency range Sampling rate (selectable) Memory	Once onset (ac onset to sine), once Dip, once ExponentUnlimitedCSV or Excel6 channels (Opt-3 NWB required)25 V, 50 V, 100 V, 250 V and 600V (old systems 550 V) ;unipolar or bipolar10 A, 25 A, 50 A, 100 A and 220 A;unipolar or bipolar16 BitVoltage: ± 0.05 % of reading ± 0.2 % of rangeCurrent: ± 0.2 % of reading ± 0.3 % of rangeDC - 100 kHz5 S/s - 500 kS/sMin. 40GB on Hard diskFile size max. 1 GByte
LED indicators Power On Active output channel Trigger Running status Functional status hard disk Operation 6 function keys Test On : ON / OFF key for the power source Inputs & Outputs Trigger 2 inputs, 2 outputs	Segments with option Anctait Segment duration Data file import Measurements (option) Input channels Input voltage ranges Input current ranges Resolution Accuracy Frequency range Sampling rate (selectable) Memory Display and Controls	Onle Onset (de onset to sine), one Exponent Unlimited CSV or Excel 6 channels (Opt-3 NWB required) 25 V, 50 V, 100 V, 250 V and 600V (old systems 550 V); unipolar or bipolar 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar 16 Bit Voltage: ± 0.05 % of reading ± 0.2 % of range Current: ± 0.2 % of reading ± 0.3 % of range DC - 100 kHz 5 S/s - 500 kS/s Min. 40GB on Hard disk File size max. 1 GByte
Active output channel Trigger Running status Functional status hard disk Operation 6 function keys Test On : ON / OFF key for the power source Inputs & Outputs Trigger 2 inputs, 2 outputs	Segments with option Anctait Segment duration Data file import Measurements (option) Input channels Input voltage ranges Input current ranges Resolution Accuracy Frequency range Sampling rate (selectable) Memory Display and Controls Display	Onlie Unser (de onser to sine), one Dip, one Exponent Unlimited CSV or Excel 6 channels (Opt-3 NWB required) 25 V, 50 V, 100 V, 250 V and 600V (old systems 550 V) ; unipolar or bipolar 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar 16 Bit Voltage: ± 0.05 % of reading ± 0.2 % of range Current: ± 0.2 % of reading ± 0.3 % of range DC - 100 kHz 5 S/s - 500 kS/s Min. 40GB on Hard disk File size max. 1 GByte
Trigger Running status Functional status hard disk Operation 6 function keys Test On : ON / OFF key for the power source Inputs & Outputs Trigger 2 inputs, 2 outputs	Segments with option Aircraft Segment duration Data file import Measurements (option) Input channels Input voltage ranges Input voltage ranges Input current ranges Resolution Accuracy Frequency range Sampling rate (selectable) Memory Display and Controls Display LED indicators	Onlie Onset (de onset to sine), onle Dip, onle Exponent Unlimited CSV or Excel 6 channels (Opt-3 NWB required) 25 V, 50 V, 100 V, 250 V and 600V (old systems 550 V); unipolar or bipolar 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar 16 Bit Voltage: ± 0.05 % of reading ± 0.2 % of range Current: ± 0.2 % of reading ± 0.3 % of range DC - 100 kHz 5 S/s - 500 kS/s Min. 40GB on Hard disk File size max. 1 GByte Text LCD 2 lines, 40 characters Power On
Running status Running status Functional status hard disk Operation 6 function keys Test On : ON / OFF key for the power source Inputs & Outputs Trigger 2 inputs, 2 outputs	Segments with option Anctait Segment duration Data file import Measurements (option) Input channels Input voltage ranges Input voltage ranges Input current ranges Resolution Accuracy Frequency range Sampling rate (selectable) Memory Display and Controls Display LED indicators	Onlie Onset to sine), onle Dip, onle Exponent Unlimited CSV or Excel 6 channels (Opt-3 NWB required) 25 V, 50 V, 100 V, 250 V and 600V (old systems 550 V); unipolar or bipolar 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar 16 Bit Voltage: ± 0.05 % of reading ± 0.2 % of range Current: ± 0.2 % of reading ± 0.3 % of range DC – 100 kHz 5 S/s – 500 kS/s Min. 40GB on Hard disk File size max. 1 GByte Text LCD 2 lines, 40 characters Power On Active output channel
Functional status hard disk Operation 6 function keys Test On : ON / OFF key for the power source Inputs & Outputs Trigger 2 inputs, 2 outputs	Segments with option Aircraft Segment duration Data file import Measurements (option) Input channels Input voltage ranges Input current ranges Resolution Accuracy Frequency range Sampling rate (selectable) Memory Display and Controls Display LED indicators	Onle Onset (de onset to sine), onle Dip, onle Exponent Unlimited CSV or Excel 6 channels (Opt-3 NWB required) 25 V, 50 V, 100 V, 250 V and 600V (old systems 550 V); unipolar or bipolar 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar 16 Bit Voltage: ± 0.05 % of reading ± 0.2 % of range Current: ± 0.2 % of reading ± 0.3 % of range DC - 100 kHz 5 S/s - 500 kS/s Min. 40GB on Hard disk File size max. 1 GByte Text LCD 2 lines, 40 characters Power On Active output channel Trigger
Operation 6 function keys Test On : ON / OFF key for the power source Inputs & Outputs Inputs & Outputs Trigger 2 inputs, 2 outputs	Segments with option Anctait Segment duration Data file import Measurements (option) Input channels Input voltage ranges Input current ranges Resolution Accuracy Frequency range Sampling rate (selectable) Memory Display and Controls Display LED indicators	Onic Oriser (de oriser to sine), onic Dip, onic Exponent Unlimited CSV or Excel 6 channels (Opt-3 NWB required) 25 V, 50 V, 100 V, 250 V and 600V (old systems 550 V) ; unipolar or bipolar 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar 16 Bit Voltage: ± 0.05 % of reading ± 0.2 % of range Current: ± 0.2 % of reading ± 0.3 % of range DC - 100 kHz 5 S/s - 500 kS/s Min. 40GB on Hard disk File size max. 1 GByte Text LCD 2 lines, 40 characters Power On Active output channel Trigger Running status
Test On : ON / OFF key for the power source Inputs & Outputs Trigger 2 inputs, 2 outputs	Segments with option Anctait Segment duration Data file import Measurements (option) Input channels Input voltage ranges Input current ranges Resolution Accuracy Frequency range Sampling rate (selectable) Memory Display and Controls Display LED indicators	Unlimited CSV or Excel 6 channels (Opt-3 NWB required) 25 V, 50 V, 100 V, 250 V and 600V (old systems 550 V) ; unipolar or bipolar 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar 16 Bit Voltage: ± 0.05 % of reading ± 0.2 % of range Current: ± 0.2 % of reading ± 0.3 % of range DC - 100 kHz 5 S/s - 500 kS/s Min. 40GB on Hard disk File size max. 1 GByte Text LCD 2 lines, 40 characters Power On Active output channel Trigger Running status Functional status hard disk
Inputs & Outputs Trigger 2 inputs, 2 outputs	Segments with option Anctait Segment duration Data file import Measurements (option) Input channels Input voltage ranges Input current ranges Resolution Accuracy Frequency range Sampling rate (selectable) Memory Display and Controls Display LED indicators	Unlimited CSV or Excel 6 channels (Opt-3 NWB required) 25 V, 50 V, 100 V, 250 V and 600V (old systems 550 V); unipolar or bipolar 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar 16 Bit Voltage: ± 0.05 % of reading ± 0.2 % of range Current: ± 0.2 % of reading ± 0.3 % of range DC - 100 kHz 5 S/s - 500 kS/s Min. 40GB on Hard disk File size max. 1 GByte Text LCD 2 lines, 40 characters Power On Active output channel Trigger Running status Functional status hard disk 6 function keys
Inputs & Outputs Trigger 2 inputs, 2 outputs	Segment swith option Anctait Segment duration Data file import Measurements (option) Input channels Input voltage ranges Input current ranges Resolution Accuracy Frequency range Sampling rate (selectable) Memory Display and Controls Display LED indicators Operation	Unlimited Unlimited CSV or Excel 6 channels (Opt-3 NWB required) 25 V, 50 V, 100 V, 250 V and 600V (old systems 550 V) ; unipolar or bipolar 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar 16 Bit Voltage: ± 0.05 % of reading ± 0.2 % of range Current: ± 0.2 % of reading ± 0.3 % of range DC - 100 kHz 5 S/s - 500 kS/s Min. 40GB on Hard disk File size max. 1 GByte Text LCD 2 lines, 40 characters Power On Active output channel Trigger Running status Functional status hard disk 6 function keys Test On : ON / OFF key for the power source
Trigger 2 inputs, 2 outputs	Segment swith option Anctait Segment duration Data file import Measurements (option) Input channels Input voltage ranges Input current ranges Resolution Accuracy Frequency range Sampling rate (selectable) Memory Display and Controls Display LED indicators Operation	Unlimited Unlimited CSV or Excel 6 channels (Opt-3 NWB required) 25 V, 50 V, 100 V, 250 V and 600V (old systems 550 V) ; unipolar or bipolar 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar 16 Bit Voltage: ± 0.05 % of reading ± 0.2 % of range Current: ± 0.2 % of reading ± 0.3 % of range DC - 100 kHz 5 S/s - 500 kS/s Min. 40GB on Hard disk File size max. 1 GByte Text LCD 2 lines, 40 characters Power On Active output channel Trigger Running status Functional status hard disk 6 function keys Test On : ON / OFF key for the power source
	Segments with option Anctait Segment duration Data file import Measurements (option) Input channels Input voltage ranges Input current ranges Resolution Accuracy Frequency range Sampling rate (selectable) Memory Display and Controls Display LED indicators Operation Inputs & Outputs	One of set (de onder to sine), one Dip, one Exponent Unlimited CSV or Excel 6 channels (Opt-3 NWB required) 25 V, 50 V, 100 V, 250 V and 600V (old systems 550 V) ; unipolar or bipolar 10 A, 25 A, 50 A, 100 A and 220 A; unipolar or bipolar 16 Bit Voltage: ± 0.05 % of reading ± 0.2 % of range Current: ± 0.2 % of reading ± 0.3 % of range DC - 100 kHz 5 S/s - 500 kS/s Min. 40GB on Hard disk File size max. 1 GByte Text LCD 2 lines, 40 characters Power On Active output channel Trigger Running status Functional status hard disk 6 function keys Test On : ON / OFF key for the power source
	Segment duration Data file import Measurements (option) Input channels Input voltage ranges Input current ranges Resolution Accuracy Frequency range Sampling rate (selectable) Memory Display and Controls Display LED indicators Inputs & Outputs Trigger	One offset (de onset to sine); one Dip, on

AMETEK CTs

DUT monitoring	2 inputs, configurable		
Signal output	Output Signal of internal arbitrary generator		
o .	(available only on all 3-phase NetWave models)		
Source Input	Input for external or internal arbitrary signal generator		
•	(available only on all 3-phase NetWave models)		
Control			
Computer	PC 104 computer		
•	AMD Microprocessor 500 MHz		
	256 MB RAM		
Operating system	Linux, with Real time extension		
DSP Signal processor	Motorola DSP 56303		
Interfaces			
	GPIB Address 130		
	Ethernet		
	USB (for Measure & Analyze NW-Board option)		
	USB (for memory stick and ext. hard disc) I max. 500 mA		
	RS232 (input from DPA analyzer)		
	Frame bus (internal system bus)		
Environmental Hard disk			
Temperature			
operating	5°C - 40°C		
storage	-20°C - 60°C		
gradient	20°C / hour		
Humidity	10% - 90% non-condensing		
Vibration			
Operating	1.0G		
Non-Operating	5.0G		
Shock			
Operating	225G (2ms)		
Non-Operating	900G (1ms)		
General Data			
Safety design	per IEC 1010, EN 61010		
	Control F1: 3.15 A slow blow (5 x 20mm)		
	AC power F2: 25 A, 500 V >120 kA (10 x 38mm)		
Input connector	CEE type or direct cable plugs		
	Cold A measured the information of the device A Free change around		

Noise (NW 30.2 operates)	60dB – A measured 1m in front of the device 1.5m above ground
Temperature	0 °C to 35 °C
Humidity	10 % to 90 %; non-condensing
Atmospheric pressure	86 kPa (860 mbar) to 106 kPa (1 060 mbar)

Dimension

Ne	tWave 20.x / 30.x	recovery	
A B	height (rolls+crane support) width	1560 (1784) 930	1560 (1784) 1210
	deep (over all C+G+M)	630 (755) 154	630 (755) 154
E	rolls diameter	125	125
F	crane support (removable)	70	80
G	Power IN	85 85	
Н	width power IN	130	130
L	height power IN	170	170
Κ	dist. power IN	345	345
L	dist. power IN	490	490
Μ	main switch	40	40
Ν	air IN distance h	na	25
0	air in distance	na	230



NetWave 60.x / 67.x



A B	height (rolls+crane support) width	1800 (2080) 1205	1800 (2080) 1615
	deep (over all C+G+W)	800 (970)	800 (970)
	relle diameter	200	200
E	rolls diameter	160	160
F	crane support (removable)	80	80
G	Power IN	100	100
Н	width power IN	200	200
L	height power IN	300	300
Κ	dist. power IN	215	215
L	dist. power IN	785	785
Μ	main switch	70	70
Ν	air IN distance h	25	25
0	air in distance	430	430



NetWave 90.x / 108.x

recovery

Α	height (crane support)	1800 (1880)	1800 (1880)
В	width	1810	2410
С	deep (over all C+G+M)	970	970
F	crane support (removable)	80	80



= => not relevant data for the standards can be changed by the manufacturer <= =

7.3. Current Limiter Ranges

	Minimum (in A)						Maximu	um (in A)
		Pea	ak Limiter		RMS I	imiter	Dook	
Model	DC	AC <75Hz	75Hz <ac <850Hz</ac 	850Hz <ac< td=""><td>DC</td><td>AC</td><td>Limiter</td><td>Continous</td></ac<>	DC	AC	Limiter	Continous
NW3	2	2	10	10	2	2	21	12
NW3.1	2	2	10	10	2	2	20	10
NW5	5	5	10	10	5	5	26	14
NW7	5	5	10	10	5	5	47	26
NW7.1	5	5	10	10	5	5	47	26
NW7.2	5	5	15	47	5	5	47	26
NW7.3	5	5	15	47	5	5	47	26
NW20	5	5	10	47	5	5	47	26
NW20.1	5	5	10	47	5	5	47	26
NW20.2	5	5	10	47	5	5	47	26
NW20.3	5	5	10	47	5	5	47	26
NW20.5	5	5	10	47	5	5	47	26
NW30	5	5	15	66	5	5	66	33
NW30.1	5	5	25	66	5	5	66	33
NW30.2	5	5	25	66	5	5	66	33
NW30.3	5	5	25	66	5	5	66	33
NW30.4	5	5	25	66	5	5	66	33
NW30.5	5	5	25	66	5	5	66	33
NW60	5	5	25	100	5	5	100	66
NW60.1	5	5	25	100	5	5	100	66
NW60.2	5	5	25	100	5	5	100	66
NW60.3	5	5	25	100	5	5	100	66
NW67	5	5	25	100	5	5	100	75
NW67.2	5	5	25	100	5	5	100	75
NW67.3	5	5	25	100	5	5	100	75
NW67.5	5	5	25	100	5	5	100	75
NW90	8	8	50	150	8	8	150	100
NW90.2	8	8	50	150	8	8	150	100
NW90.3	8	8	50	150	8	8	150	100
NW90.5	8	8	50	150	8	8	150	100
NW108.3	8	8	50	150	8	8	150	100
NW108.5	8	8	50	150	8	8	150	100

7.4. Graphs

7.4.1.Graphs NetWave 3.1























7.4.7. Graphs NetWave 108.3 / 108.5



7.4.8. Graphs NetWave 90.3MS



7.5. Power Dissipation



7.6. Output Impedance for IEC 61000-4-29 testing

The standard IEC 61000-4-29 defines the impedance conditions of the dc source during the short interruptions as follow:

Generator impedance defined in IEC 61000-4-29

operate in "low impedance" condition, absorbing inrush current from the load (if any), or
operate in "high impedance" condition, blocking reverse current from the load.

The test generator, during the generation of voltage dips and voltage variations, shall operate in "low impedance" condition.

Preferred test levels and durations for short interruptions

Test	Test conditions	Test level [% U _T]	Duration [s]
			0.001
			0.003
	High impedance		0.01
Short	and / or	0	0.03
interruption	low Impedance		0.1
			0.3
			1
			Х

The output impedance of the **NetWave** generator during a short DIP or interruption is in "**Iow impedance**". The impedance value during this short time is approx. $10m\Omega$ or less. During this time the power dissipation is up to 20'000W or more for absorb inrush currents in the range of some milliseconds. For more information see graphics in the previous chapter dissipation power.

8. Maintenance

8.1. General

The NetWave is maintenance-free.

Replacement of storage battery

Lithium battery: CR 2032 after approx. 10 years (indicates by memory loss of setting)

8.2. Calibration and Verification

8.2.1. Factory calibration

Every EM TEST generator is entirely checked and calibrated as per international standard regulations before delivery. A calibration certificate is issued and delivered along with a list of the equipment used for the calibration proving the traceability of the measuring equipment. All auxiliary equipment and accessories are checked to our internal manufacturer guidelines.

The calibration certificate and the certificate of compliance (if available) show the date of calibration.

The EM Test equipment are calibrated in the factory and marked with a calibration mark. The used measuring instruments are traceable to the Swiss Federal Office of Metrology.

The calibration date is marked. The validity of the calibration is to the responsibility of the user's quality system. Neither the certificate of calibration nor the corresponding label marks any due date for re-calibration.



Example: Calibration mark

8.2.2. Guideline to determine the calibration period of EM Test instrumentation

Our International Service Departments and our QA Manager are frequently asked about the calibration interval of EM TEST equipment.

EM TEST doesn't know each customer's Quality Assurance Policy, nor do we know how often the equipment is used and what kind of tests is performed during the life cycle of test equipment. Only the customer knows all the details and therefore the customer needs to specify the calibration interval for his test equipment.

In reply to all these questions we like to approach this issue as follows:

EM TEST make use of a solid-state semiconductor switch technique to generate high voltage transients. A precious advantage of this technique is the absolute lack of periodical maintenance effort. In consequence thereof, a useful calibration period must be defined based on two criteria:

- The first one is the customer's Quality Assurance Policy. Any existent internal regulation must be applied at highest priority. In the absence of such internal regulation the utilization rate of the test equipment must be taken into consideration.
- Based on the experience and observation collected over the years **EM TEST recommends a calibration** interval of 1 year for frequently used equipment. A 2-years calibration interval is considered sufficient for rarely used test generators to assure proper performance and compliance to the standard specifications.

8.2.3. Calibration of Accessories made by passive components only:

Passive components do not change their technical specification during storage. Consequently, the measured values and the plots stay valid throughout the storage time. The date of shipment shall be considered as the date of calibration.

8.2.4. Periodically In-house verification

Please refer to the corresponding standard before carrying out a calibration or verification. The standard describes the procedure, the tolerances and the necessary auxiliary means. Suitable calibration adapters are needed. To compare the verification results, EM Test suggests referring to the wave shape and values of the original calibration certificate.

8.3. Calibration

For periodical calibration the NetWave must be returned the manufacturer. For Alternatives please contact your

8.4. Verification

Verification can be done by following the instruction procedures in chapter Functional test.

8.5. Fuses

8.5.1.Fuses NetWave 7

The fuses are located at the **right side** of the NetWave behind the cover. To replace the user must open the four screws at the right-side cover.



Fuses for power unit R, S, TRated voltage:500 VRated current :25 Aslow blowDimension :10 x 38 mmBreaking capacity:>120 kA

Fuses for 230Vac powerRated voltage:250 VRated current :3.15 A slow blowDimension :5 x 20 mm

Fuses for 24Vac power

Rated voltage: Rated current : Dimension :

250 V 1 A slow blow 5 x 20 mm



8.5.2.Fuses NetWave 3 / 5

The fuses are located at the **right side** of the NetWave behind the cover. For replace the user must open the four screws at the right-side cover.



Fuses for 230Vac 1-phase power unit

Rated voltage:500 VRated current :32 ADimension :10 x 38 mmBreaking capacity:>120 kA

Fuses for 230Vac power

Rated voltage: Rated current : Dimension : 250 V 3.15 A slow blow 5 x 20 mm

Fuses for 24Vac power

Rated voltage: Rated current : Dimension : 250 V 1 A slow blow 5 x 20 mm



8.5.3.Fuses NetWave 30.x

The fuses are located at the **right side** of the NetWave behind the cover. For replace the user must open the four screws at the cover.

	1
F1 F3 Fuses for General Input Line R S T	
Rated voltage: 500 V	GIUP 22 x 50
Rated current : 80 A	SO A
Type : CH22 / gG ITALWEBER 1441080	
Breaking capacity: >120 kA	22x58 mm
F4 – F 6 Fuses for Line Inverter phase unit R, S, T	
Rated voltage: 500 V	
Rated current : 1 A slow blow	Soo Soo
Dimension : 10 x 38 mm	10v29 mm
Type : aM Legrand	10x30 11111
Breaking capacity: >120 kA	
F7 F 0 Fuene for langet Augiliers Transformer	
F7 – F8 Fuses for input Auxiliary Transformer	
Rated voltage: 500V	A 10 10 10 10 10 10 10 10 10 10 10 10 10
Dimension : 4A Slow blow	Quanta a la companya de la
	10x38 mm
Reaking capacity: >120 kA	
Dreaking capacity. >120 KA	
F9 – F 10 Fuses for Output Auxiliary Transformer	
Rated voltage: 250 V	
Rated current : WGT 5 A slow blow	and the
Dimension : 5 x 20 mm	5x20 mm
	520 1111
F11 – F 12 Fuses for Controller	
Rated voltage: 250 V	
Rated current : WGT 3.15 A slow blow	ALC: LOG
Dimension : 5 x 20 mm	5x20 mm
F13 – F 20 Fuses for Auxiliary Supply Inverter Phase R, S, T and Fan	
Rated voltage: 250 V	
Rated current : WGT 2.5 A slow blow	and the
Dimension : 5 x 20 mm	5x20 mm
F21 – F 22 Fuses for Safety Circuit	
Rated voltage: 250 V	
Rated current WGT 1 A slow blow	
Dimension : $5 \times 20 \text{ mm}$	E y 20 mm
	5x20 mm
	I

8.5.4.Fuses NetWave 60.x / 67.x

The fuses are located at the **rear side** of the NetWave behind the cover. For replace the user must open the screws at the cover.

11.1.0 1050	es for Genera	Input Line R, S,	т	
Rated voltage:	500 V			THE R
Rated current :	160 A			400 A
Type :	HN00 gL / g	G	ITALWEBER 0364-160	te te
Breaking capacity:	>100 kA			
F4 – F 12 Fuse	es for Line Inv	verter phase unit	R, S, T	
Rated voltage:	400 V			all of the first
Rated current :	50 A slow	blow		RET RE
Dimension :	14 x51mm			14x51 mm
Type :	SCH14 gG		ITALWEBER 1431050	
Breaking capacity:	>120kA			
F13 – F 21 Fuse	es for Charge	resistor		
Rated voltage:	500 V			
Rated current :	1 A slow	blow		Soo Soo
Dimension :	10 x 38 mm			10v29 mm
Type :	aM		Legrand	10230 [[[[[]
Breaking capacity:	>100 kA			
F22 – F 23 Fuse	es for Input A	uxiliary Transfor	mer	
Rated voltage:	500 V			
Rated current :	4 A slow	blow		B a M
Dimension :	10 x 38 mm			10x38 mm
Туре :	aM		Wimex	10230 11111
Breaking capacity:	>120 kA			
F24 – F 25 Fuse	os for Output	Auxiliary Transf		
			ormer	
Rated voltage:	250 V		ormer	
Rated current :	250 V WGT 5 A	slow blow	ormer	
Rated voltage: Rated current : Dimension :	250 V WGT 5 A 5 x 20 mm	slow blow	ormer	5x20 mm
Rated voltage: Rated current : Dimension : F26 – F 27 Fuse	250 V WGT 5 A 5 x 20 mm	slow blow	ormer	5x20 mm
Rated voltage: Rated current : Dimension : F26 – F 27 Fuse Rated voltage:	250 V WGT 5 A 5 x 20 mm es for Control 250 V	slow blow	ormer	5x20 mm
Rated voltage: Rated current : Dimension : F26 – F 27 Fuse Rated voltage: Rated current :	250 V WGT 5 A 5 x 20 mm 250 V WGT 3.15 A	slow blow	ormer	5x20 mm
Rated voltage: Rated current : Dimension : F26 – F 27 Fuse Rated voltage: Rated current : Dimension :	250 V WGT 5 A 5 x 20 mm es for Control 250 V WGT 3.15 A 5 x 20 mm	slow blow ler slow blow	ormer	5x20 mm
Rated voltage:Rated current :Dimension :F26 - F 27FuseRated voltage:Rated current :Dimension :F28 - F 35Fuse	250 V WGT 5 A 5 x 20 mm 250 V WGT 3.15 A 5 x 20 mm es for Auxiliar	slow blow ler slow blow y Supply Inverte	r Phase R, S, T and Fan	5x20 mm
Rated voltage:Rated current :Dimension :F26 - F 27FuseRated voltage:Rated current :Dimension :F28 - F 35FuseRated voltage:	250 V WGT 5 A 5 x 20 mm 250 V WGT 3.15 A 5 x 20 mm es for Auxiliar 250 V	slow blow ler slow blow y Supply Inverte	r Phase R, S, T and Fan	5x20 mm
Rated voltage: Rated current : Dimension : F26 – F 27 Fuse Rated voltage: Rated current : Dimension : F28 – F 35 Fuse Rated voltage: Rated voltage: Rated current :	250 V WGT 5 A 5 x 20 mm 250 V WGT 3.15 A 5 x 20 mm es for Auxiliar 250 V WGT 2.5 A	slow blow ler slow blow y Supply Inverte slow blow	r Phase R, S, T and Fan	5x20 mm
Rated voltage: Rated current : Dimension : F26 – F 27 Fuse Rated voltage: Rated current : Dimension : F28 – F 35 Fuse Rated voltage: Rated voltage: Rated current : Dimension :	250 V WGT 5 A 5 x 20 mm es for Control 250 V WGT 3.15 A 5 x 20 mm es for Auxiliar 250 V WGT 2.5 A 5 x 20 mm	slow blow ler slow blow y Supply Inverte slow blow	r Phase R, S, T and Fan	5x20 mm 5x20 mm
Rated voltage:Rated current :Dimension :F26 - F 27FuseRated voltage:Rated current :Dimension :F28 - F 35FuseRated voltage:Rated voltage:Rated current :Dimension :F36 - F 37Fuse	250 V WGT 5 A 5 x 20 mm es for Control 250 V WGT 3.15 A 5 x 20 mm es for Auxiliar 250 V WGT 2.5 A 5 x 20 mm es for optiona	slow blow ler slow blow y Supply Inverte slow blow	r Phase R, S, T and Fan	5x20 mm 5x20 mm 5x20 mm
Rated voltage:Rated current :Dimension :F26 - F 27FuseRated voltage:Rated current :Dimension :F28 - F 35FuseRated voltage:Rated current :Dimension :F36 - F 37FuseRated voltage:	250 V WGT 5 A 5 x 20 mm es for Control 250 V WGT 3.15 A 5 x 20 mm es for Auxiliar 250 V WGT 2.5 A 5 x 20 mm es for optiona 250 V	slow blow ler slow blow y Supply Inverte slow blow	r Phase R, S, T and Fan	5x20 mm
Rated voltage:Rated current :Dimension :F26 - F 27FuseRated voltage:Rated current :Dimension :F28 - F 35FuseRated voltage:Rated current :Dimension :F36 - F 37FuseRated voltage:Rated voltage:Rated voltage:Rated current :Dimension :	250 V WGT 5 A 5 x 20 mm es for Control 250 V WGT 3.15 A 5 x 20 mm es for Auxiliar 250 V WGT 2.5 A 5 x 20 mm es for optiona 250 V WGT 5 A	slow blow ler slow blow y Supply Inverte slow blow I Equipment slow blow	r Phase R, S, T and Fan	5x20 mm
Rated voltage:Rated current :Dimension :F26 - F 27FuseRated voltage:Rated current :Dimension :F28 - F 35FuseRated voltage:Rated current :Dimension :F36 - F 37FuseRated voltage:Rated voltage:Rated voltage:Rated current :Dimension :	250 V WGT 5 A 5 x 20 mm es for Control 250 V WGT 3.15 A 5 x 20 mm es for Auxiliar 250 V WGT 2.5 A 5 x 20 mm es for optiona 250 V WGT 5 A 5 x 20 mm	slow blow ler slow blow y Supply Inverte slow blow I Equipment slow blow	r Phase R, S, T and Fan	5x20 mm 5x20 mm 5x20 mm
Rated voltage:Rated current :Dimension :F26 - F 27FuseRated voltage:Rated current :Dimension :F28 - F 35FuseRated voltage:Rated voltage:Rated current :Dimension :F36 - F 37FuseRated voltage:Rated voltage:Rated current :Dimension :F36 - F 37FuseRated current :Dimension :F38 - F 39Fuse	250 V WGT 5 A 5 x 20 mm es for Control 250 V WGT 3.15 A 5 x 20 mm es for Auxiliar 250 V WGT 2.5 A 5 x 20 mm es for optiona 250 V WGT 5 A 5 x 20 mm	slow blow ler slow blow y Supply Inverte slow blow I Equipment slow blow	r Phase R, S, T and Fan	5x20 mm 5x20 mm 5x20 mm 5x20 mm
Rated voltage:Rated current :Dimension :F26 - F 27FuseRated voltage:Rated current :Dimension :F28 - F 35FuseRated voltage:Rated voltage:Rated current :Dimension :F36 - F 37FuseRated voltage:Rated voltage:Rated voltage:Rated current :Dimension :F36 - F 37FuseRated current :Dimension :F38 - F 39FuseRated voltage:	250 V WGT 5 A 5 x 20 mm es for Control 250 V WGT 3.15 A 5 x 20 mm es for Auxiliar 250 V WGT 2.5 A 5 x 20 mm es for optiona 250 V WGT 5 A 5 x 20 mm es for Safety (250 V	slow blow ler slow blow y Supply Inverte slow blow I Equipment slow blow	r Phase R, S, T and Fan	5x20 mm 5x20 mm 5x20 mm
Rated voltage:Rated current :Dimension :F26 - F 27FuseRated voltage:Rated current :Dimension :F28 - F 35FuseRated voltage:Rated voltage:Rated current :Dimension :F36 - F 37FuseRated voltage:Rated current :Dimension :F36 - F 37FuseRated current :Dimension :F38 - F 39FuseRated voltage:Rated voltage:Rated voltage:Rated voltage:Rated voltage:Rated voltage:Rated voltage:Rated voltage:	250 V WGT 5 A 5 x 20 mm es for Control 250 V WGT 3.15 A 5 x 20 mm es for Auxiliar 250 V WGT 2.5 A 5 x 20 mm es for optiona 250 V WGT 5 A 5 x 20 mm es for Safety (250 V WGT 1 A	slow blow ler slow blow y Supply Inverte slow blow I Equipment slow blow Circuit slow blow	r Phase R, S, T and Fan	5x20 mm 5x20 mm 5x20 mm 5x20 mm
Rated voltage:Rated current :Dimension :F26 - F 27FuseRated voltage:Rated current :Dimension :F28 - F 35FuseRated voltage:Rated voltage:Rated current :Dimension :F36 - F 37FuseRated voltage:Rated current :Dimension :F36 - F 37FuseRated voltage:Rated current :Dimension :F38 - F 39FuseRated voltage:Rated current :Dimension :	250 V WGT 5 A 5 x 20 mm es for Control 250 V WGT 3.15 A 5 x 20 mm es for Auxiliar 250 V WGT 2.5 A 5 x 20 mm es for optiona 250 V WGT 5 A 5 x 20 mm es for Safety (250 V WGT 1 A 5 x 20 mm	slow blow ler slow blow y Supply Inverter slow blow I Equipment slow blow Circuit slow blow	r Phase R, S, T and Fan	5x20 mm 5x20 mm 5x20 mm 5x20 mm

8.5.5.Fuses NetWave 90.x

The fuses are located at the **rear side** of the NetWave behind the cover. For replace the user must open the screws at the cover.

F1F3 Rated voltage: Rated current : Type : Breaking capacity:	Fuses for Ge 500 V 250 A NH1 gL / gG >100 kA	eneral Input Line R, S, T ITALWEBER 1510250	
F4 – F 12 Rated voltage: Rated current : Dimension : Type : Breaking capacity:	Fuses for Li 400 V 100 A 14 x51 mm SCH14 gG >120 kA	ne Inverter phase unit R, S, T slow blow ITALWEBER 1441099	TALWEBER SET RER 14x51mm
F13 – F 21 Rated voltage: Rated current : Dimension : Type : Breaking capacity:	Fuses for Cl 500 V 1 A 10 x 38 mm aM >100 kA	narge resistor slow blow Legrand	10x38 mm
F22, F 23 Rated voltage: Rated current : Dimension : Type : Breaking capacity:	Fuses for In 500 V 8 A 10 x 38 mm aM >120 kA	put Auxiliary Transformer slow blow Wimex	10x38 mm
F24, F 25 Rated voltage: Rated current : Dimension :	Fuses for O 250 V WGT 15 A 5 x 20 mm	utput Auxiliary Transformer slow blow	5x20 mm
F26 - F 28, F32, F36 Rated voltage: Rated current : Dimension :	Fuses for Co 250 V WGT 6.3 A 5 x 20 mm	slow blow	5x20 mm
F29 – F 31, F33 – 35, F37-F39 Rated voltage: Rated current : Dimension :	Fuses for Au 250 V WGT 2.5 A 5 x 20 mm	Ix. Supply Inverter Phase R, S, T and Fan slow blow	5x20 mm
F40, F41 Rated voltage: Rated current : Dimension :	Fuses for Sa 250 V WGT 1 A 5 x 20 mm	Ifety Circuit slow blow	5x20 mm

8.5.6.Fuses NetWave 108.x

The fuses are located at the **rear side** of the NetWave behind the cover. For replace the user must open the screws at the cover.

F1F3 Rated voltage: Rated current : Type : Breaking capacity:	Fuses for Go 500 V 315 A NH2 gL / gG >100 kA	eneral Input Line R, S, T ITALWEBER 162031	
F4 – F 12 Rated voltage: Rated current : Dimension : Type : Breaking capacity:	Fuses for Li 400 V 125 A 14 x51 mm SCH14 gG >120 kA	ne Inverter phase unit R, S, T slow blow ITALWEBER 1431100	TALWEBER 14x51mm
F13 – F 21 Rated voltage: Rated current : Dimension : Type : Breaking capacity:	Fuses for Cl 500 V 1 A 10 x 38 mm aM >100 kA	narge resistor slow blow Legrand	10x38 mm
F22, F 23 Rated voltage: Rated current : Dimension : Type : Breaking capacity:	Fuses for In 500 V 8 A 10 x 38 mm aM >120 kA	put Auxiliary Transformer slow blow Wimex	10x38 mm
F24, F 25 Rated voltage: Rated current : Dimension :	Fuses for O 250 V WGT 15 A 5 x 20 mm	utput Auxiliary Transformer	5x20 mm
F26 - F 28, F32, F36 Rated voltage: Rated current : Dimension :	Fuses for Co 250 V WGT 6.3 A 5 x 20 mm	slow blow	5x20 mm
F29 – F 31, F33 – 35, F37-F39 Rated voltage: Rated current : Dimension :	Fuses for Au 250 V WGT 2.5 A 5 x 20 mm	ux. Supply Inverter Phase R, S, T and Fan	5x20 mm
F40, F41 Rated voltage: Rated current : Dimension :	Fuses for Sa 250 V WGT 1 A 5 x 20 mm	afety Circuit slow blow	5x20 mm
9. Accessories and options

9.1. Opt-1 NWB / Opt-3 NWB (NetWave Measure Board)

1 Phase Systems

- Built-in 2 channels measuring board 16 Bit resolution 100 kS/s

Input voltage 500 V unipolar or bipolar

Input current 150 A unipolar or bipolar

3 Phase Systems

- Built-in 6channels measuring board 16 Bit resolution 200 kS/s

Input voltage 500 V unipolar or bipolar

Input current 220 A unipolar or bipolar

Part-NO.	Name	Description	NetWaves
105352	Opt-1 NWB	Built-in 2 channel measurement board for voltage	NetWave 3,
	(1 Phase)	and current (internal measurements)	NetWave 5
			NetWave 7, 7.2, 7.3
106268	Opt-3 NWB (3 Phase)	Built-in 6 channel (3-phase) measurement board for voltage and current, remote controlled per USB interface	NetWave 20.x
			NetWave 30.x
			NetWave 60.x
			NetWave 67.x
			NetWave 90.x
			NetWave 108.x

9.2. Opt-3 DC-EVR (3 phase systems)

With this option it is possible to double the DC voltage range by using two phases simultaneously. The phase 1 is used for +DC and the phase 2 is used for –DC pole. The using of this function is only supported by net.control software.



The following extended voltages can be reached :

NetWave 20, 30, 60, 67 : 425 VDC → 850 VDC

NetWave 20.2, 30.2, 60.2, 67.2, 90.2 : 500 VDC → 1'000 VDC

NetWave 20.3, 30.3, 60.3, 67.3, 90.3, 108.3 : 560 VDC → 1'120 VDC

Part- NO.	Name	Description	NetWaves
112732	Opt-3 DC-EVR	Double DC voltage range, using two phases simultaneously, available only for 3-phase NetWaves	NetWave 20.x NetWave 30.x NetWave 60.x
			NetWave 90.x NetWave 108.x

9.3. Opt-3 MultiSource (3 phase systems)

With this option it is possible to put 3 single NetWave in multi-source configuration to get one NetWave with enhanced combined AC power. See more information on chapter 8.4.



3 x NetWave 20 kW)	-> NetWave 20MS	(67.5 kVA, 27
3 x NetWave 20.2 kW)	-> NetWave 20.2MS	(67.5 kVA, 27
3 x NetWave 20.3 kW)	-> NetWave 20.3MS	(67.5 kVA, 27
3 x NetWave 30 3 x NetWave 30.2 3 x NetWave 30.3	-> NetWave 30MS -> NetWave 30.2MS -> NetWave 30.3MS	(90 kVA, 36 kW) (90 kVA, 36 kW) (90 kVA, 36 kW)
3 x NetWave 67 3 x NetWave 67.2 3 x NetWave 67.3	-> NetWave 67MS -> NetWave 67.2MS -> NetWave 67.3MS	(201 kVA, 72 kW) (201 kVA, 72 kW) (201 kVA, 72 kW)
3 x NetWave 90.2 kW)	-> NetWave 90.2MS	(270 kVA, 110
3 x NetWave 90.3 kW)	-> NetWave 90.3MS	(270 kVA, 110

3 x NetWave 108.3-> NetWave 108.3MS (324 kVA, 150 kW)



NetWave

Possible device configuration at Opt-3 MS :

	00.0							N	1S = Multi So	ource, CS – C	ascade Sou	rce
	20	20.2	20.3	20	20.2	20.3	67	67.2	67.3	90.2	90.3	108.3
	MS	MS	MS	MS								
AC Voltage (p-n) – MS	300	360	400	300	360	400	300	360	400	360	400	400
AC Voltage (p-n) (1 Phase) – CS	600	720	800	600	720	800	600	720	800	720	800	800
DC Voltage – MS	425	500	560	425	500	560	425	500	560	425	560	560
DC Voltage – CS	850	1000	1120	850	1000	1120	850	1000	1120	100	1120	1120
Output Power AC (kVA) – MS	67.5	67.5	67.5	90	90	90	201	201	201	270	270	324
Output Power AC (kVA) – CS	22.5	22.5	22.5	30	30	30	67	67	67	90	90	108
Output Power DC (kW) – MS	27	27	27	32	32	32	72	72	72	110	110	110
Output Power DC (kW) – CS	54	54	54	64	64	64	144	144	144	220	220	300
Output Current continuous (A)	78	78	78	99	99	99	225	225	225	300	300	300
Output Current sh. t. (max. 3s) (A)	141	141	141	198	198	198	300	300	300	450	450	450
Output Current repetitive peak (A)	400	400	400	500	500	500	600	600	600	1000	1000	1000
NetWave 20 with Opt-3 Parallel	Зx											
NetWave 20.2 with Opt-3 Parallel		Зx										
NetWave 20.3 with Opt-3 Parallel			Зx									
NetWave 30 with Opt-3 Parallel				Зx								
NetWave 30.2 with Opt-3 Parallel					Зx							
NetWave 30.3 with Opt-3 Parallel						Зx						
NetWave 67 with Opt-3 Parallel							Зx					
NetWave 67.2 with Opt-3 Parallel								3x				
NetWave 67.3 with Opt-3 Parallel									3x			
NetWave 90.2 with Opt-3 Parallel										Зx		
NetWave 90.3 with Opt-3 Parallel											Зx	
NetWave 108.3 with Opt-3 Parallel												3x
Opt-3 CS	1	✓	✓	1	1	1	✓	1	1	✓	1	✓
Opt-3 Recovery	opt.	opt.	✓	opt.	opt.		opt.	opt.	- ✓	opt.	√	✓
Enhanced Voltage Range at MS	not	not	not	not								
Enhanced Voltage Range at CS	yes	yes	yes	yes								

It is not possible to put several MultiSource/CascadeSource-NetWave sources in parallel to increase the max. voltage or current further.

Additional a connection box is available (Connection L1, L2, L3, N, PE and for each line sense) :

CB-MS-20/30	Box with 3 sense connections, 3phase Input/Output, 5 power cable, 3 sense cables with connectors for connection of 3 NetWave 20 or NetWave 30 in MultiSource		Connection Box MS
CB-MS-67	Box with 3 sense connections, 3phase Input/Output, 5 power cable, 3 sense cables with connectors for connection of 3 NetWave 67 in MultiSource	D	
CB-MS-90/108	Box with 3 sense connections, 3phase Input/Output, 5 power cable, 3 sense cables with connectors for connection of 3 NetWave 90 or NetWave 108 in MultiSource	Output L3	L2 Power Input Slave L2 L2 Sense Input
			L3 Power Input

9.4. Opt-3 CascadeSource (3 phase systems)

With this option it is possible to put 2 single NetWave in cascade source configuration to get one NetWave with enhanced combined DC power. See more information on chapter 8.5.

Slave L3

L3 Sense N Input



2 x NetWave 20	-> NetWave 20CS	(22.5 kVA, 54 kW)
2 x NetWave 20.2	-> NetWave 20.2CS	(22.5 kVA, 54 kW)
2 x NetWave 20.3	-> NetWave 20.3CS	(22.5 kVA, 54 kW)
2 x NetWave 30	-> NetWave 30CS	(30 kVA, 72 kW)
2 x NetWave 30.2	-> NetWave 30.2CS	(30 kVA, 72 kW)
2 x NetWave 30.3	-> NetWave 30.3CS	(30 kVA, 72 kW)
2 x NetWave 67	-> NetWave 67CS	(67 kVA, 144 kW)
2 x NetWave 67.2	-> NetWave 67.2CS	(67 kVA, 144 kW)
2 x NetWave 67.3	-> NetWave 67.3CS	(67 kVA, 144 kW)
2 x NetWave 90.2	-> NetWave 90.2CS	(90 kVA, 220 kW)
2 x NetWave 90.3	-> NetWave 90.3CS	(90 kVA, 220 kW)
2 x NetWave 108.3	3-> NetWave 108.3CS	(108 kVA, 300 kW)
		· · · · · · · · · · · · · · · · · · ·













Possible device configuration at Opt-3 CS :

<u> </u>		-								С	S = Casc	adeSource
	20	20.2	20.3	30	30.2	30.3	67	67.2	67.3	90.2	90.3	108.3
	CS	CS										
AC Voltage (L-N) (3 Phase)	300	360	400	300	360	400	300	360	400	360	400	400
AC Voltage (L-N) (1 Phase)	600	720	800	600	720	800	600	720	800	720	800	800
DC Voltage	850	1000	1120	850	1000	1120	850	1000	1120	1000	1120	1120
Output Power AC (kVA) (3 Phase)	22.5	22.5	22.5	30	30	30	67	67	67	90	90	108
Output Power AC (kVA) (1 Phase)	45	45	45	60	60	60	134	134	134	180	180	216
Output Power DC (kW)	54	54	54	64	64	64	144	144	144	220	220	300
Output Current continuous (A)	78	78	78	99	99	99	225	225	225	300	300	300
Output Current sh. ter. (max. 3s) (A)	141	141	141	198	198	198	300	300	300	450	450	450
Output Current repetitive peak (A)	400	400	400	500	500	500	600	600	600	1000	1000	1000
NetWave 20 with Opt-3 Parallel	2x											
NetWave 20.2 with Opt-3 Parallel		2x										
NetWave 20.3 with Opt-3 Parallel			2x									
NetWave 30 with Opt-3 Parallel				2x								
NetWave 30.2 with Opt-3 Parallel					2x							
NetWave 30.3 with Opt-3 Parallel						2x						
NetWave 60 with Opt-3 Parallel							2x					
NetWave 60.2 with Opt-3 Parallel								2x				
NetWave 60.3 with Opt-3 Parallel									2x			
NetWave 90.2 with Opt-3 Parallel										2x		
NetWave 90.3 with Opt-3 Parallel											2x	
NetWave 108.3 with Opt-3 Parallel												2x
Opt-3 Recovery	opt.	opt.		opt.	opt.		opt.	opt.		opt.		

It is not possible to put several CascadeSource-NetWave sources in parallel to increase the max. voltage or current further.

Additional a connection box is available (Connection L, N, PE and for each line sense) :

CB-CS-20/30	Connection box with 2 sense connections, 1phase Input/Output, 6 power cable, 2 sense cables with connectors for connection of 2 NetWave 20 or NetWave 30 in CascadeSource	
CB-CS-67	Connection box with 2 sense connections, 1phase Input/Output, 6 power cable, 2 sense cables with connectors for connection of NetWave 67 in CascadeSource	Power Output
CB-CS-90/108	Connection box with 2 sense connections, 1phase Input/Output, 6 power cable, 2 sense cables with connectors for connection of 2 NetWave 90 or NetWave 108 in CascadeSource	



9.5. Power mains matching transformer

- 3 Phase mains matching transformer 208 V to 400 V
- 3 Phase cable to connect the matching transformer

9.6. Framebus Termination

- Framebus terminating for matching the end of the Framebus. The framebus, an internal bus system, is used for control EM Test devices and work as daisy chain between the equipment. Longer bus systems must be terminated with a Framebus termination.
- NetWave with 3-phase have already built in the frame bus terminating.



- ERP number 101732

9.7. Filter Box F-BOX

The filter box is a low pass filter that suppresses high frequency content distortions. It is used in situations where the output noise of the NetWave is too high, i.e. emission measurements.

It is mandatory to be used for tests "Voltage Distortion Spectrum" as per MIL-STD-704 LDC/HDC 103 or MIL-STD-461 . Test condition A (10 Hz) and B (25 Hz) needs for filter the small distortion signal (< 0.5 V rms) the additional filter box.

F-BOX 1

Application:

Voltage: Current: Frequency Dimension: Weight: 1-phase NetWave 7 AC :230 V , DC: 420 V 26 A max. 60 Hz 190 x 72 x 110 mm (L x W x H) (plug +24mm) 0.83 kg

F-BOX 3

Application: 3-phase NetWave 20, 30, 60, 90 models

Voltage:	AC :230 V , DC: 500 V	
Frequency	max. 60 Hz	
Current:	60 A	100 A
Dimension $(L \times W \times H)$:	200 x 150 x 86 mm	255 x 180 x 88 mm
Weight:	1.65 kg	3.25 kg

F-BOX 3-200

Application: 3-phase NetWave 90 and 108 models

 Voltage:
 AC :230 V, DC: 500 V

 Frequency
 max. 60 Hz

 Current:
 200 A

 Dimension (L x W x H):
 570 x 345 x 325 mm

 Weight:
 approx. 5kg









First connect the device to protective earth.

Switch off the voltage of the source before accessing the input or output terminals.

Use only the insulated allen key for tigheting or losing the screws of the terminal blocks

Typical filter curve F-Box



Application

The F-Box is used for testing voltage distortion spectrum under test condition A/B. The figure below illustrates that the F-Box is connected direct at the DC generator output.





9.8. Filter Box L-BOX

The Filter box is mandatory to be used for tests "Voltage Distortion Spectrum" as per MIL-STD-704 LDC103 and test condition C and K.

L-BOX 1-32			
Application: A	1-phase NetWave 7	and 3-ph NetWave up to 32	
Voltage: Current: Frequency Dimension (HxWxD) : Weight:	AC :360 V, DC: 500 32 A max. 60 Hz 3 HU approx. 15 kg	V 154 x 448 x 500 mm	
L-BOX 1-100			
Application:	3-phase NetWave a	Il models	
Voltage: Frequency Current: Temperature Dimension (HxWxD): Weight:	AC :360 V, DC: 500 max. 60 Hz 100 A < 60 °C internal 6 HU approx. 25 kg	V 289 x 448 x 500 mm	Front L-Box 1-100A
Power Fuse L-BOX 1-200	100 – 254 V 2x 1 AT (slow blow)		
Application:	3-phase NetWave a	ll models	and we
Voltage: Frequency Current: Temperature Dimension (L x W x H Weight:	AC :400 V, DC: 560 max. 60 Hz 200 A < 60 °C internal):810 x 270 x 230 mn approx. 25 kg	N	
weight.	appiùs. 20 kg		

Power Fuse



First connect the device to protective earth by using the earth bolt on either side of the device.

Switch off the voltage of the source before accessing the input or output terminals.

Use only the insulated allen key for tigheting or losing the screws of the terminal blocks

Always switch on the fans before using the device.

100 – 254 V

2x 3.15 AT (slow blow)

Application

The L-Box is used for testing voltage distortion spectrum under test condition C and K. The figure below illustrates that the L-Box is connected direct at the DC generator output.



5. CAUTION: Verify suitability of variable frequency power source and coupling transformerfor distortion spectrum testing.

FIGURE LDC103-2. Normal operation - voltage distortion spectrum (50 Hz to 10 kHz).

9.9. C-Box 10/100-1000

	•
	C-BOX 10/100-1000
Application:	shunt capacitor for ripple test, i.e. ripple on high voltage DC lines of electrical vehicles
Voltage: Capacitance: Connector:	700 VAC / 1000 VDC 10 μ F and 100 μ F, jumper selectable 6mm lab connectors
Dimension (HxWxD) : Weight:	278 x 278 x 130 mm approx. 6 kg

Application



The C-Box 10/100-1000 is a shunt capacitor used for ripple testing. It is connected to the DC lines between the coupling transformer (CN 200Nxxx) and the source (NetWave). During ripple testing the ripple current is flowing through the C-Box and by that forms a low impedance path. This minimizes the ripple current flowing through the output filters of the DC source. Ideally it is placed as close as possible to the coupling transformer to minimize the impedance.

The jumper allows to select between 10 μF and 100 μF capacitance.



Only set the jumper when no voltage is present.

Do not remove the jumper when voltage is present on the DC lines.

9.10. Opt-3 IMD - Insulation Monitoring Device

The insulation monitor is an external device connected to the NetWave. It constantly monitors the insulation resistance of the phases (L1, L2, L3) to the protective earth. In case the insulation resistance is below a set limit, the safety circuit is tripped and the output of the NetWave is switched off.



The switch **"FLOATING – PE"** must be set to the "floating" position. Otherwise the insulation monitor will detect the insulation failure and will switch off the NetWave.

To perform measurement where it is required to have N and PE connected, it is necessary to disconnect the Insulation Monitor from the NetWave. Make sure to reinstall the safety circuit directly to the NetWave.

The NetWave limits the output voltage to 600VDC when operating in the High Voltage DC Mode (Opt-3 DC-EVR). This prevents the NetWave from damage in case of wrong electrical connection of the outputs.

Insulation Monitoring Device (MD)

Manufacturer: Type:	Bender iso 685
Application:	3-ph NetWave up to 32 A
Voltage:	AC :690 V, DC: 1000 V

The manual for this insulation monitor can be downloaded here: <u>https://www.bender.org/documents/manuals/iso685-D_D00022_M_XXEN.pdf</u>

Connection schematic



Wiring diagram



Wiring:

- Interconnection cable from NetWave to IMD, 5 wires (L1, L2, L3, N, PE) -
- Emergency switch interconnection cable from NetWave to IMD Emergency switch button with cable connected to IMD -
- -

The IMD is tested and delivered with these standard settings:

Alarm	Limit 1	10 kΩ
	Limit 2	1 kΩ
Memory		ON
DC		None
Profile		Power Circuits
System		3AC
Coupling		None
Device		Active
Tstart		0
Input monitor		Off

Typical values

TEST ON switched off	80 kΩ
TEST ON switched on	64 kΩ

AMETEK CTs

10. Annex

10.1. Manual firmware update



- **B:** Another possibility is to update the firmware manually. This is necessary if the firmware version is not part of the net.control installation package.
- **1b.** Copy the firmware package (NetWave_x_xx_tgz) into the installation folder of the net.control software

C:\Program Files (x86)\EM TEST\netcontrol\ProgData\Update



NetWave

Update NetWave firmware
Actual Firmware Version Select the Firmware 6.0.0.8 NetWave_6_06_09 Start the Update Transfer file to device
100%
Reboot : please wait!
Actual Firmware Version Select the Firmware 6.0.0.8 NetWave_6_06_09 Start the Update
Update NetWave firmware Actual Firmware Version 6.0.0.9 NetWave_6_06_09 Start the Update Device upgraded 100%

10.2. Interlock Feature

There are two versions of the interlock available that depend on the model and the serial number: All models except xx.5: interlock that indicates the operating status, no control xx.5 models: enhanced interlock with control and auxiliary contacts

Models	Interlock control	Interlock auxiliary
NetWave 20 / 20.2 /	Not available	Yes
20.3, 30 / 30.2 / 30.3, 67		
/ 67.2 / 67.3, 108.3		
NetWave 20.5 / 30.5 /	yes	Yes
67.5 / 108.5		

10.2.1. Interlock Auxiliary (AUX)

The AUX interlock is a passive circuit that indicates the operating status of the source. It does not provide an active output voltage, nor does it actively switch on or off the NetWave.

For each phase of the NetWave a separate power module is used. Each power module has a built-in monitoring function. As soon as an internal failure is detected (i.e. overcurrent, over temperature etc.) the power module is switched off. In parallel a relay contact is switched. This AUX interlock can be used to control external devices. A typicall use case is a DC current breaker for electrical vehicle or inverter testing.

For each phase a relays switch is available to indicate the operating condition:

Contact open	Power module is switched off because of internal failure (i.e. overtemperature) or switch-off signal received from control unit.
Contact closed	Normal operating mode at power on.

Connector Details AUX



1-2

3-4

5-6

Pinout of the connector:

Phase L1

Phase L2

Phase L3

Receptable Hirschmann STAKEI 5

Matching Connector: Hirschmann STAS 5

Relays Type : Finder 55 series, model 55.32 Max. AC : 250 V / 10 A Max. DC : 250 V / 10 A State : NO (normally open)

Possible use of the interlock switch is:

 Control of an external circuit breaker to switch off the voltage at the output, input or both

Possible wiring diagram for external circuit breaker

Certain applications require an external circuit breaker, i.e. to protect the NetWave from kickback voltages (inverter testing).

Wiring diagram:



Note: see above for power ratings of relay contacts.

10.2.2. Interlock CONTROL

NetWave models with the CONTROL interlock feature offer additional interlock functionalities. It allows to actively control the output switch of the NetWave. It also includes two relay contacts that indicate the status of the switch.

All NetWave with interlock CONTROL also include the interlock AUX connectors (see above).

Connector Details CONTROL





Receptable (mounted on the back panel) Hirschmann STASEI 5

Matching Connector Hirschmann STAK 5

PIN	Description	Rating
1	Voltage output	24 VAC, max. 0.1 Arms
2	Control input	24 VAC, 1.5 VA
3 and 4	Indicator relay –	Max. 10 Arms / 690 VAC
5 and 6	Indicator relay – normally closed	Max. 10 Arms / 690 VAC

Pin 1 provides a 24 VAC supply Pin 2 is the control line of the NetWave output relay

Pin 3 and 4 are the contacts of the first indicator relay (normaly open) Pin 5 and 6 are the contacts of the second indicator relay (normally closed).

The two relays operate inversely.

Possible connection diagram for external switch and warning lamp using



The external switch closes the 24 VAC control signal to the output breaker. In parallel two auxiliary relays are connected that indicate the status of the output breaker.









10.4. NetWave - Overview Diagram



10.5. NetWave - General Diagram



11. Declaration of CE-Conformity

11.1. CE Conformity NetWave single phase models

Manufacturer:	Ametek CTS GmbH
Address:	Sternenhofstrasse. 15 CH 4153 Reinach
	Switzerland

Declares, that under is sole responsibility, the product's, listed below, including all their options, are conformity with the applicable CE directives listed below using the relevant section of the following EC standards and other normative documents.

Product 's name:	NetWave
Model Number(s)	NetWave 3, NetWave 3-208, NetWave 3-230 NetWave 5 NetWave 7, NetWave 7-208, NetWave 7-480 NetWave 7.1, NetWave 7.2, NetWave 7.3, NetWave 7.3-208, NetWave 7.3-400, NetWave 7.3-480

Low Voltage Directive 2014/35/EU

Standard to which conformity is declared:

EN 61010-1: 2011	Safety requirements for electrical equipment for measurement, control, and
	laboratory use.

EMC Directive 2014/30/EU

Standard(s) to which conformity is declared:

EN 61326-1: 2013	Electrical equipment for measurement, control and laboratory use Class A
EN 61000-3-2 Ed. 5	Limits for harmonic current emissions
EN 61000-3-3 Ed. 3, A1	Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems.

Manufacturer AMETEK CTS GmbH Sternenhofstrasse. 15 CH 4153 Reinach Tel: +41 61-204 4111

A. Burger Business Manager Conducted EMC Reinach BL, Switzerland 1. February 2020

By

Manufacturer:

Product 's name:

Address:

Ametek CTS GmbH

Sternenhofstrasse. 15 CH 4153 Reinach Switzerland

Declares, that under is sole responsibility, the product's, listed below, including all their options, are conformity with the applicable CE directives listed below using the relevant section of the following EC standards and other normative documents.

Troduct 5 Hame.	nethave
Model Number(s)	NetWave 20, 20-208, 20-400
	NetWave 20.2, 20.2-400, 20.2-480
	NetWave 20.3, 20.2-400, 20.2-480

NotWavo

Low Voltage Directive 2014/35/EU

Standard to which conformity is declared:

EN 61010-1: 2011 Safety requirements for electrical equipment for measurement, control, and laboratory use.

EMC Directive 2014/30/EU

Standard(s) to which conformity is declared:

EN 61326-1: 2013	Electrical equipment for measurement, control and laboratory use Class A
EN 61000-3-2 Ed. 5	Limits for harmonic current emissions
EN 61000-3-3 Ed. 3, A1	Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems.

Manufacturer AMETEK CTS GmbH Sternenhofstrasse. 15 CH 4153 Reinach Tel: +41 61-204 4111

A. BurgerBusiness Manager Conducted EMCReinach BL, Switzerland1. February 2020

Bу

Manufacturer:

Address:

Ametek CTS GmbH

Sternenhofstrasse. 15 CH 4153 Reinach Switzerland

Declares, that under is sole responsibility, the product's, listed below, including all their options, are conformity with the applicable CE directives listed below using the relevant section of the following EC standards and other normative documents.

Product 's name:	NetWave
Model Number(s)	NetWave 30, NetWave 30-400 NetWave 30.2, NetWave 30.2-400, NetWave 30.2-480 NetWave 30.3, NetWave 30.3-400, NetWave 30.3-480 NetWave 30.4-400

Low Voltage Directive 2014/35/EU

Standard to which conformity is declared:

EN 61010-1: 2011

Safety requirements for electrical equipment for measurement, control, and laboratory use.

EMC Directive 2014/30/EU

Standard(s) to which conformity is declared:

EN 61326-1: 2013	Electrical equipment for measurement, control and laboratory use Class A
EN 61000-3-2 Ed. 5	Limits for harmonic current emissions
EN 61000-3-3 Ed. 3, A1	Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems.

Manufacturer AMETEK CTS GmbH Sternenhofstrasse. 15 CH 4153 Reinach Tel: +41 61-204 4111

A. Burger **Business Manager Conducted EMC** Reinach BL, Switzerland 1. February 2020

By

Manufacturer:

Address:

Ametek CTS GmbH

Sternenhofstrasse. 15 CH 4153 Reinach Switzerland

Declares, that under is sole responsibility, the product's, listed below, including all their options, are conformity with the applicable CE directives listed below using the relevant section of the following EC standards and other normative documents.

Product 's name:	NetWave
Model Number(s)	NetWave 60, NetWave 60-400 NetWave 60.2, NetWave 60.2-400, NetWave 60.2-480 NetWave 60.3, NetWave 60.3-400, NetWave 60.3-480

Low Voltage Directive 2014/35/EU

Standard to which conformity is declared:

EN 61010-1: 2011	Safety requirements for electrical equipment for measurement, control, and
	laboratory use.

EMC Directive 2014/30/EU

Standard(s) to which conformity is declared:

EN 61326-1: 2013	Electrical equipment for measurement, control and laboratory use Class A
EN 61000-3-2 Ed. 5	Limits for harmonic current emissions
EN 61000-3-3 Ed. 3, A1	Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems.

Manufacturer AMETEK CTS GmbH Sternenhofstrasse. 15 CH 4153 Reinach Tel: +41 61-204 4111

A. BurgerBusiness Manager Conducted EMCReinach BL, Switzerland1. February 2020

By

11.5. CE Conformity NetWave 67.x

Manufacturer:

Address:

Ametek CTS GmbH

Sternenhofstrasse. 15 CH 4153 Reinach Switzerland

Declares, that under is sole responsibility, the product's, listed below, including all their options, are conformity with the applicable CE directives listed below using the relevant section of the following EC standards and other normative documents.

Product 's name:	NetWave
Model Number(s)	NetWave 67, NetWave 67-400 NetWave 67.2, NetWave 67.2-400, NetWave 67.2-480 NetWave 67.3, NetWave 67.3-400, NetWave 67.3-480

Low Voltage Directive 2014/35/EU

Standard to which conformity is declared:

EN 61010-1: 2011	Safety requirements for electrical equipment for measurement, control, and
	laboratory use.

EMC Directive 2014/30/EU

Standard(s) to which conformity is declared:

EN 61326-1: 2013	Electrical equipment for measurement, control and laboratory use Class A
EN 61000-3-2 Ed. 5	Limits for harmonic current emissions
EN 61000-3-3 Ed. 3, A1	Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems.

Manufacturer AMETEK CTS GmbH Sternenhofstrasse. 15 CH 4153 Reinach Tel: +41 61-204 4111

A. BurgerBusiness Manager Conducted EMCReinach BL, Switzerland1. February 2020

By

11.6. CE Conformity NetWave 90.x

Manufacturer:	Ametek CTS GmbH
Address:	Sternenhofstrasse. 15 CH 4153 Reinach Switzerland
Declares, that under is sol the applicable CE directive	e responsibility, the product's, listed b as listed below using the relevant sect

Declares, that under is sole responsibility, the product's, listed below, including all their options, are conformity with the applicable CE directives listed below using the relevant section of the following EC standards and other normative documents.

Product 's name:	NetWave
Model Number(s)	NetWave 90.2, NetWave 90.2-400, NetWave 90.2-480 NetWave 90.3, NetWave 90.3-400, NetWave 90.3-480

Low Voltage Directive 2014/35/EU

Standard to which conformity is declared:

EN 61010-1: 2011	Safety requirements for electrical equipment for measurement, control, and laboratory use.

EMC Directive 2014/30/EU

Standard(s) to which conformity is declared:

EN 61326-1: 2013	Electrical equipment for measurement, control and laboratory use Class A
EN 61000-3-2 Ed. 5	Limits for harmonic current emissions
EN 61000-3-3 Ed. 3, A1	Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems.

Manufacturer AMETEK CTS GmbH Sternenhofstrasse. 15 CH 4153 Reinach Tel: +41 61-204 4111

A. BurgerBusiness Manager Conducted EMCReinach BL, Switzerland1. February 2020

By

11.7. CE Conformity NetWave 108.x

Manufacturer:

Address:

Ametek CTS GmbH

Sternenhofstrasse. 15 CH 4153 Reinach Switzerland

Declares, that under is sole responsibility, the product's, listed below, including all their options, are conformity with the applicable CE directives listed below using the relevant section of the following EC standards and other normative documents.

Product 's name:	NetWave
Model Number(s)	NetWave 108.3, NetWave 108.3-400, NetWave 108.3-480

Low Voltage Directive 2014/35/EU

Standard to which conformity is declared:

EN 61010-1: 2011	Safety requirements for electrical equipment for measurement, control, and
	laboratory use.

EMC Directive 2014/30/EU

Standard(s) to which conformity is declared:

EN 61326-1: 2013	Electrical equipment for measurement, control and laboratory use Class A
EN 61000-3-2 Ed. 5	Limits for harmonic current emissions
EN 61000-3-3 Ed. 3, A1	Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems.

Manufacturer AMETEK CTS GmbH Sternenhofstrasse. 15 CH 4153 Reinach Tel: +41 61-204 4111

By

Place Date A. BurgerBusiness Manager Conducted EMCReinach BL, Switzerland1. February 2020

11.8. CE Conformity Filter Box

Manufacturer:

Address:

Ametek CTS GmbH

Sternenhofstrasse. 15 CH 4153 Reinach Switzerland

Declares, that under is sole responsibility, the product's, listed below, including all their options, are conformity with the applicable CE directives listed below using the relevant section of the following EC standards and other normative documents.

Product 's name:	F-BOX
Model Number(s)	F-BOX 1, F-BOX 3, F-BOX 3-200

Low Voltage Directive 2014/35/EU

Standard to which conformity is declared:

EN 61010-1: 2011	Safety requirements for electrical equipment for measurement, control, and
	laboratory use.

EMC Directive 2014/30/EU

Standard(s) to which conformity is declared:

EN 61326-1: 2013	Electrical equipment for measurement, control and laboratory use Class A
EN 61000-3-2 Ed. 5	Limits for harmonic current emissions
EN 61000-3-3 Ed. 3, A1	Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems.

Manufacturer AMETEK CTS GmbH Sternenhofstrasse. 15 CH 4153 Reinach Tel: +41 61-204 4111

By

Place Date A. BurgerBusiness Manager Conducted EMCReinach BL, Switzerland1. February 2020

11.9. CE Conformity L-Box

Manufacturer:

Address:

Ametek CTS GmbH

Sternenhofstrasse. 15 CH 4153 Reinach Switzerland

Declares, that under is sole responsibility, the product's, listed below, including all their options, are conformity with the applicable CE directives listed below using the relevant section of the following EC standards and other normative documents.

Product 's name:	L-BOX
Model Number(s)	L-BOX 1-32, L-BOX 1-100, L-BOX 1-200

Low Voltage Directive 2014/35/EU

Standard to which conformity is declared: EN 61010-1: 2011 Safety requirements for electrical equipment for measurement, control, and laboratory use.

EMC Directive 2014/30/EU

Standard(s) to which conformity is declared:

EN 61326-1: 2013	Electrical equipment for measurement, control and laboratory use Class A
EN 61000-3-2 Ed. 5	Limits for harmonic current emissions
EN 61000-3-3 Ed. 3, A1	Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems.

Manufacturer AMETEK CTS GmbH Sternenhofstrasse. 15 CH 4153 Reinach Tel: +41 61-204 4111

A. BurgerBusiness Manager Conducted EMCReinach BL, Switzerland1. February 2020

By

11.10. CE Conformity C-Box

Manufacturer:

Address:

Ametek CTS GmbH

Sternenhofstrasse. 15 CH 4153 Reinach Switzerland

Declares, that under is sole responsibility, the product's, listed below, including all their options, are conformity with the applicable CE directives listed below using the relevant section of the following EC standards and other normative documents.

Product 's name:	C-Box
------------------	-------

Model Number(s)	C-Box 10/100-1000
-----------------	-------------------

Low Voltage Directive 2014/35/EU

Standard to which conformity is declared:

EN 61010-1: 2011	Safety requirements for electrical equipment for measurement, control, and
	laboratory use.

EMC Directive 2014/30/EU

Standard(s) to which conformity is declared:

EN 61326-1: 2013	Electrical equipment for measurement, control and laboratory use Class A
EN 61000-3-2 Ed. 5	Limits for harmonic current emissions
EN 61000-3-3 Ed. 3, A1	Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems.

Manufacturer AMETEK CTS GmbH Sternenhofstrasse. 15 CH 4153 Reinach Tel: +41 61-204 4111

By

Place Date A. BurgerBusiness Manager Conducted EMCReinach BL, Switzerland1. February 2020