

	Opt	3.1	3.3	7	7.3
Number of Lines		1	1	1	1
Segment Power AC and DC		•	•	•	•
Point Power AC and DC / Point Period AC		•	•	•	•
Mode „Simple“, „Source AC“, „Extern“			•		•
Point files – Converter (AC)		•	•	•	•
Trigger channel			•		•
Offset channel		•	•	•	•
Simple controlling via MATLAB (AC)			•		•
External sockets for „Signal Output“ / „Source Input“			•		•
Internal or external Sense (4 wires)		•	•	•	•
Built-In Measurements (Volt. + Cur.)		•	•	•	•
Protection (Volt., Cur., Temp., Low Volt.)		•	•	•	•
Select. Ranges for Voltage Drop Comp.		• 4)	• 4)	• 4)	• 4)
Select. Current Limit (Ipeak or Irms)		• 4)	• 4)	• 4)	• 4)
Select. higher isolation imp. @ output (270kΩ, 90kΩ)			• 4)		• 4)
Output Voltage AC (V) (p-n)		310	360	300	360
Output Voltage AC (V) (p-p)					
Output Voltage DC (V)		440	500	425	500
Output Power AC (kVA)		3	3	7.5	7.5
Output Power DC (kW)		4.25	4.25	9	9
Power connector (-phase)		1	1	3	3
Output Current continuous (A) ¹⁾		10	10	26	26
Output Current short term (max. 3s) (A) ¹⁾		20	20	47	47
Output Current repetitive peak (A) ¹⁾		70	70	200	200
Bandwidth (kHz)		5	5	5	5
Ripple (V) (0..50V)		0.9	0.3	0.9	0.3
Ripple (V) (> 50V)		0.9	0.9	0.9	0.9
Distortion (THD) (%)		< 0.5	< 0.5	< 0.5	< 0.5
Output Voltage Stability (%)		< 0.1	< 0.1	< 0.1	< 0.1
Output Voltage Accuracy (%)		< 0.5	< 0.5	< 0.5	< 0.5
Phase Accuracy (°)		1	1	1	1
Frequency Accuracy – Mainlines (ppm)		100	100	100	100
Maximum Slew Rate (V /us)		8	8	8	8
Max. Comp. Drop on Wire (% of set voltage)		5	5	5	5
Isolated Output			•		
Opt-3 DC-EVR (Enhanced Voltage Range) ^{2,5)}	•				
Enhanced Output Voltage DC (V)					
Opt-3 Recovery (upgradable) ^{2,5)}	•				
Recoverable Power AC (kVA)					
Recoverable Power DC (kW)					
Power Factor (cos phi)					
Nominal Current (A)					
Peak Current 3s (A)					
Peak Current Repetitive (A)					
Opt-1NWB (Measure Board) (upgradable)	•	•	•	•	•
Opt-3 NWB (Measure Board) (upgradable)					
Measure in Parallel Mode					
Min. Voltage Range (V)		25	25	25	25
Max. Voltage Range (V)		500	500	500	500
Min. Current Range (A)		7	7	7	7
Max. Current Range (A)		150	150	150	150
Resolution (Bit)		16	16	16	16
Voltage Accuracy (%)		< 0.2	< 0.2	< 0.2	< 0.2
Current Accuracy (%)		< 0.5	< 0.5	< 0.5	< 0.5
Max. Sample Rate (kS/s)		100	100	100	100
Max. Frequency (kHz)		50	50	50	50
Opt-3 Parallel (not upgradable)	•				
Nominal Current (A) ¹⁾					
Peak Current 3s (A) ¹⁾					
Peak Current Repetitive (A)					
Opt-3 MS (MultiSource) / Opt-3 CS (CascadeSource)	•				

1) Specified at 300Vac/425Vdc 2) Devices built before 2013 are not upgradeable 3) Built in 4) Devices from November 2017, Not upgradeable 5) Not in parallel Mode

	20	20.2	20.3	20.5	30	30.2	30.3	30.5
Output Voltage AC (p-n) (V)	300	360	400	400	300	360	400	400
Output Voltage AC (p-p) (V)	520	620	690	690	520	620	690	690
Output Voltage DC (V)	425	500	560	560	425	500	560	560
Output Power AC (kVA)	22.5	22.5	22.5	22.5	30	30	30	30
Output Power DC (kW)	27	27	27	27	36	36	36	36
Power Connector (-phase)	3	3	3	3	3	3	3	3
Output Current continuous (A) ¹⁾	26	26	26	26	33	33	33	33
Output Current short term (max. 3s) (A) ¹⁾	47	47	47	47	66	66	66	66
Output Current repetitive peak (A) ¹⁾	200	200	200	200	250	250	250	250
Bandwidth (kHz)	5	5	5	5	5	5	5	5
Ripple (V) (0..50V)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Ripple (V) (> 50V)	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Distortion (THD) (%)	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Output Voltage Stability (%)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Output Voltage Accuracy (%)	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Phase Accuracy (°)	1	1	1	1	1	1	1	1
Frequency Accuracy – Mainlines (ppm)	100	100	100	100	100	100	100	100
Maximum Slew Rate (V /us)	8	8	8	8	8	8	8	8
Max. Comp. Drop on Wire (% of set voltage)	5	5	5	5	5	5	5	5
Isolated Output	•	•	•	•	•	•	•	•
Isolated Output / Isolation voltage L1, L2, L3, N to PE (VDC)	600	600	600	1000	600	600	600	1000
Isolated Output / Isolation voltage L1, L2, L3, N to PE (VAC)	460	460	460	700	460	460	460	700

Opt-3 DC-EVR (Enhanced Voltage Range) ^{2,5)}	•	•	✓ ³⁾	✓ ³⁾	•	•	✓ ³⁾	✓ ³⁾
Enhanced Output Voltage DC (V)	850	1000	1120	1000	850	1000	1120	1000

Opt-3 Recovery (upgradable) ^{2,5)}	•	•	✓ ³⁾	✓ ³⁾	•	•	✓ ³⁾	✓ ³⁾
Recoverable Power AC (kVA)	22.5	22.5	22.5	22.5	30	30	30	30
Recoverable Power DC (kW)	27	27	27	27	36	36	36	36
Power Factor (cos phi)	.92	.92	.92	.92	.92	.92	.92	.92
Nominal Current (A)	26	26	26	26	33	33	33	33
Peak Current 3s (A)	47	47	47	47	66	66	66	66
Peak Current Repetitive (A)	200	200	200	200	250	250	250	250

Opt-3 NWB (Measure Board) (upgradable)	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.
Measure in Parallel Mode	•	•	•	•	•	•	•	•
Min. Voltage Range (V)	25	25	25	25	25	25	25	25
Max. Voltage Range (V)	550	550	550	550	550	550	550	550
Min. Current Range (A)	10	10	10	10	10	10	10	10
Max. Current Range (A)	220	220	220	220	220	220	220	220
Resolution (Bit)	16	16	16	16	16	16	16	16
Voltage Accuracy (%)	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Current Accuracy (%)	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Max. Sample Rate (kS/s)	200	200	200	200	200	200	200	200
Max. Frequency (kHz)	100	100	100	100	100	100	100	100

Opt-3 Parallel (not upgradable)	Opt.	Opt.	Opt.	✓ ³⁾	Opt.	Opt.	Opt.	✓ ³⁾
Nominal Current (A) ¹⁾	•	•	•	•	99	99	99	99
Peak Current 3s (A) ¹⁾	78	78	78	78	198	198	198	198
Peak Current Repetitive (A)	141	141	141	141	500	500	500	500

Opt-3 MS (MultiSource) / Opt-3 CS (CascadeSource)					•	•	•	•
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1) Specified at 300Vac/425Vdc 2) Devices built before 2013 are not upgradeable 3) Built in 4) Devices from November 2017, Not upgradeable 5) Not in parallel Mode

✓³⁾ Included

	67	67.2	67.3	67.5	90.2	90.3	90.5	108.3
Output Voltage AC (V) (p-n)	300	360	400	400	360	400	400	400
Output Voltage AC (V) (p-p)	520	620	690	690	620	690	690	690
Output Voltage DC (V)	425	500	560	560	500	560	560	560
Output Power AC (kVA)	67	67	67	67	90	90	90	108
Output Power DC (kW)	72	72	72	72	110	110	110	150
Power Connector (-phase)	3	3	3	3	3	3	3	3
Output Current continuous (A) ¹⁾	75	75	75	75	100	100	100	100 ²⁾
Output Current short term (max. 3s) (A) ¹⁾	100	100	100	100	150	150	150	150 ²⁾
Output Current repetitive peak (A) ¹⁾	400	400	400	400	500	500	500	500 ²⁾
Bandwidth (kHz)	5	5	5	5	5	5	5	5
Ripple (V) (0..50V)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Ripple (V) (> 50V)	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Distortion (THD) (%)	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Output Voltage Stability (%)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Output Voltage Accuracy (%)	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Phase Accuracy (°)	1	1	1	1	1	1	1	1
Frequency Accuracy – Mainlines (ppm)	100	100	100	100	100	100	100	100
Maximum Slew Rate (V /us)	8	8	8	8	8	8	8	8
Max. Comp. Drop on Wire (% of set voltage)	5	5	5	5	5	5	5	5
Isolated Output	•	•	•	•	•	•	•	Yes
Isolated Output / Isolation voltage L1, L2, L3,N to PE (VDC)	600	600	600	1000	600	600	1000	600
Isolated Output / Isolation voltage L1, L2, L3, N to PE (VAC)	460	460	460	700	460	460	700	460
Opt-3 DC-EVR (Enhanced Voltage Range) ³⁾	Opt.	Opt.	✓ ³⁾	✓ ³⁾	Opt.	✓ ³⁾	✓ ³⁾	✓ ⁴⁾
Enhanced Output Voltage DC (V)	850	1000	1120	1000	1000	1120	1000	1120
Opt-3 Recovery	Opt.	Opt.	✓ ³⁾	✓ ³⁾	•	✓ ³⁾	✓ ³⁾	✓ ⁴⁾
Recoverable Power AC (kVA)	60	60	60	60	90	90	90	108
Recoverable Power DC (kW)	72	72	72	72	110	110	110	150
Power Factor (cos phi)	.92	.92	.92	.92	.92	.92	.92	.92
Nominal Current (A)	66	66	66	66	100	100	100	100
Peak Current 3s (A)	100	100	100	100	150	150	150	150
Peak Current Repetitive (A)	400	400	400	400	500	500	500	500
Opt-3 NWB (Measure Board) (upgradable)	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.
Measure in Parallel Mode	•	•	•	•	•	•	•	•
Min. Voltage Range (V)	25	25	25	25	25	25	25	25
Max. Voltage Range (V)	600	600	600	600	600	600	600	600
Min. Current Range (A)	10	10	10	10	10	10	10	10
Max. Current Range (A)	220	220	220	220	220	220	220	220
Resolution (Bit)	16	16	16	16	16	16	16	16
Voltage Accuracy (%)	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Current Accuracy (%)	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Max. Sample Rate (kS/s)	200	200	200	200	200	200	200	200
Max. Frequency (kHz)	100	100	100	100	100	100	100	100
Opt-3 Parallel (not upgradable)	Opt.	Opt.	Opt.	✓ ³⁾	Opt.	Opt.	✓ ³⁾	Opt.
Nominal Current (A) ¹⁾	225	225	225	225	300	300	300	300
Peak Current 3s (A) ¹⁾	300	300	300	300	450	450	450	450
Peak Current Repetitive (A)	600	600	600	600	1000	1000	1000	1000
Opt-3 MS (MultiSource) / Opt-3 CS (CascadeSource)	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.

1) Specified at 300Vac/425Vdc 2) Devices built before 2013 are not upgradeable 3) Built in 4) Devices from November 2017, Not upgradable 5) Not in parallel Mode
 ✓³⁾ Included

Common Features for all 3-Phase Models (20/30/60/67/90/108)

	20
Number of Lines	3
Segment Power AC and DC	•
Point Power AC and DC / Point Period AC	•
Mode „Simple“, “Source AC”, “Extern”	•
Point files – Converter (AC)	•
Trigger channel	•
Offset channel	•
Simple controlling via MATLAB (AC)	•
External sockets for „Signal Output“ / “Source Input”	•
Internal or external Sense (4 wires)	•
Built-In Measurements (Volt. + Cur.)	•
Protection (Volt., Cur., Temp., Low Volt.)	•
Selectable Ranges for Voltage Drop Comp.	• ⁴⁾
Selectable Current Limit (Ipeak or Irms)	• ⁴⁾
Select. higher isolation imp. @ output (270kΩ, 90kΩ)	• ⁴⁾

1) Specified at 300Vac/425Vdc 2) Devices built before 2013 are not upgradeable 3) Build in 4) Devices from November 2017, Not upgradeable 5) Not in parallel Mode

Cancelled products

	Opt	3	5	7.1	7.2	20.1	30.1	60.1	10
Number of Lines		1	1	1	1	3	3	3	1
Segment Power AC and DC		•	•	•	•	•	•	•	•
Point Power AC and DC / Point Period AC		•	•	•	•	•	•	•	•
Mode „Simple“, „Source AC“, „Extern“									
Point files – Converter (AC)		•	•	•	•	•	•	•	•
Trigger channel									
Offset channel		•	•	•	•	•	•	•	•
Simple controlling via Matlab (AC)									
External sockets for „Signal Output“									
External sockets for „Source Input“									
Internal or external Sense (4 wires)		•	•	•	•	•	•	•	•
Built-In Measurements (V + I)		•	•	•	•	•	•	•	•
Protection (Volt, Cur., Temp, Low Voltage)		•	•	•	•	•	•	•	•
Selectable Ranges for Voltage Drop Comp.									
Selectable Current Limit (Ipeak or Irms)									
Output Voltage AC (V)		300	300	360	360	360	360	360	300
Output Voltage DC (V)		425	425	500	500	500	500	500	425
Output Power AC (kVA)		3.5	4.2	7.5	7.5	22.5	30	60	10
Output Power DC (kW)		4.5	4.2	9	9	27	36	72	12
Power connector (-phase)		1	1	1	3	3	3	3	3
Output Current continuous (A) ¹⁾		12		26	26	26	33	66	
Output Current short term (max. 3s) (A) ¹⁾		21		47	47	47	66	100	
Output Current repetitive peak (A) ¹⁾		100		200	200	200	250	400	
Output Impedance Low R (mOhm)		5		10	10	20	15	6	
Output Impedance Low L (uH)		0.9		65	65	65	60	30	
Output Noise (Vrms) (0..50V)		0.9	0.32	0.11	0.11	0.32	0.32	0.32	0.32
Output Noise (Vrms) (> 50V)		< 0.5	0.32	0.32	0.32	0.32	0.32	0.32	0.32
Ripple (V) (0..50V)		< 0.1	0.9	0.3	0.3	0.9	0.9	0.9	0.9
Ripple (V) (> 50V)		< 0.5	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Isolated Output		No	No	Yes	No	Yes	Yes	Yes	No
Selectable higher isolation imp. @ output		No	No	No	No	No	No	No	No
Opt-3 Recovery (not upgradable)									
Opt-3 NWB (Measure Board) (upgradable)		•	•	•	•	•	•	•	•
Min. Voltage Range (V)		25	25	25	25	25	25	25	25
Max. Voltage Range (V)		500	500	550	500	550	550	550	500
Min. Current Range (A)		7	7	10	7	10	10	10	7
Max. Current Range (A)		150	150	220	150	220	220	220	150
Resolution (Bit)		16	16	16	16	16	16	16	16
Voltage Accuracy (%)		< 0.2	< 0.2	< 0.3	< 0.2	< 0.3	< 0.3	< 0.3	< 0.2
Current Accuracy (%)		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Max. Sample Rate (kS/s)		100	80	80	80	200	200	200	80
Max. Frequency (kHz)		50	50	50	50	100	100	100	50
Opt-3 Parallel									

1) Specified at 300Vac/425Vdc parallel Mode

2) Devices built before 2013 are not upgradeable

3) Built in

4) Devices from November 2017, Not upgradable

5) Not in

	60	60.2	60.3
Number of Lines	3	3	3
Segment Power AC and DC	•	•	•
Point Power AC and DC / Point Period AC	•	•	•
Mode „Simple“, „Source AC“, „Extern“	•	•	•
Point files – Converter (AC)	•	•	•
Trigger channel	•	•	•
Offset channel	•	•	•
Simple controlling via MATLAB (AC)	•	•	•
External sockets for „Signal Output“ / „Source Input“	•	•	•
Internal or external Sense (4 wires)	•	•	•
Built-In Measurements (Volt. + Cur.)	•	•	•
Protection (Volt., Cur., Temp., Low Volt.)	•	•	•
Output Voltage AC (V)	300	360	400
Output Voltage DC (V)	425	500	560
Output Power AC (kVA)	60	60	60
Output Power DC (kW)	72	72	72
Power Connector (-phase)	3	3	3
Output Current continuous (A) ¹⁾	66	66	66
Output Current short term (max. 3s) (A) ¹⁾	100	100	100
Output Current repetitive peak (A) ¹⁾	400	400	400
Bandwidth (kHz)	5	5	5
Ripple (V) (0..50V)	0.3	0.3	0.3
Ripple (V) (> 50V)	0.9	0.9	0.9
Distortion (THD) (%)	< 0.5	< 0.5	< 0.5
Output Voltage Stability (%)	< 0.1	< 0.1	< 0.1
Output Voltage Accuracy (%)	< 0.5	< 0.5	< 0.5
Phase Accuracy (°)	1	1	1
Frequency Accuracy – Mainlines (ppm)	100	100	100
Maximum Slew Rate (V / μ s)	8	8	8
Max. Comp. Drop on Wire (% of set voltage)	5	5	5
Isolated Output	•	•	•
Opt-3 DC-EVR (Enhanced Voltage Range) ^{2,5)}	•	•	✓ ³⁾
Enhanced Output Voltage DC (V)	850	1000	1120
Opt-3 Recovery (upgradable) ^{2,5)}	•	•	✓ ³⁾
Recoverable Power AC (kVA)	60	60	60
Recoverable Power DC (kW)	72	72	72
Power Factor (cos phi)	.92	.92	.92
Nominal Current (A)	66	66	66
Peak Current 3s (A)	100	100	100
Peak Current Repetitive (A)	400	400	400
Opt-3 NWB (Measure Board) (upgradable)	•	•	•
Measure in Parallel Mode			
Min. Voltage Range (V)	25	25	25
Max. Voltage Range (V)	550	550	550
Min. Current Range (A)	10	10	10
Max. Current Range (A)	220	220	220
Resolution (Bit)	16	16	16
Voltage Accuracy (%)	< 0.3	< 0.3	< 0.3
Current Accuracy (%)	< 0.5	< 0.5	< 0.5
Max. Sample Rate (kS/s)	200	200	200
Max. Frequency (kHz)	100	100	100
Opt-3 Parallel (not upgradable)	•	•	•
Nominal Current (A) ¹⁾	198	198	198
Peak Current 3s (A) ¹⁾	300	300	300
Peak Current Repetitive (A)	600	600	600

1) Specified at 300Vac/425Vdc 2) Devices built before 2013 are upgradeable 3) Build in 5) Not in parallel Mode

New Device Features :

Features	Description	Info
Selectable Ranges for Voltage Drop Compensation	- The ranges for voltage drop compensation are now configurable via firmware/software. - The following ranges are possible 5%, 10% and 15%.	- Devices from September 2017, Not upgradable
Selectable Current Limit (Ipeak or Irms)	- The used current limit is configurable via firmware/software. - Ipeak • It is activated quite fast and it blocks the current to the maximum peak current • Faster, it blocks immediately the output current independently if it is absorbing or generating. • Stable, it blocks the current without problem of stability • It limits the inverter current and the output current depend of the load and the frequency of the generator. • When active the output voltage is distorted - Irms • It is reducing the reference to limit the output current • It is working on the output current. • The output voltage is not distorted • It is slow (50ms), in this time the output current can be the maximum output current of the machine. • It is instable with battery load and regenerative load.	- Devices from September 2017, Not upgradable
Selectable higher isolation imp. @ output (270kΩ, 90kΩ)	- The output resistance with machine on is now configurable via Hardware switch. - The following isolation impedances are possible 66kΩ or 270 kΩ at one phase (33kΩ or 90kΩ at three phase) - The input resistance with machine off and normally is >10Mohm.	- Devices from September 2017, Not upgradable

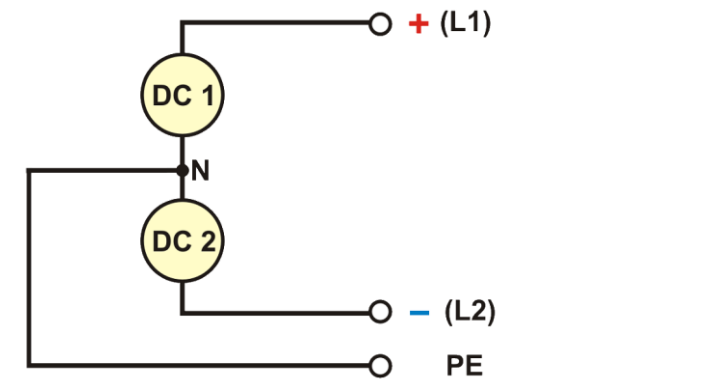
New Options :

Option	Description	Requirements and limitations
Opt-3 DC-EVR	- DC extended voltage range. Double DC voltage range, using two phases simultaneously	- Devices built before 2013 are not upgradeable - Not in parallel mode
Opt-3 MS	- Put 3 single NetWaves in multi source configuration (parallel configuration) to get one 3phase NetWave with enhanced combined power.	- Devices built before September 2017 are not upgradeable - Opt-3 Parallel is required - Opt-3 CS automatic possible
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.	- Devices built before September 2017 are not upgradeable - Opt-3 Parallel is required

	20	20.2	20.3	30	30.2	30.3	67	67.2	67.3	90.2	90.3	108.3
AC Voltage (p-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.	✓	opt.	opt.	✓	opt.	opt.	✓	opt.	✓	✓
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.	✓	opt.	opt.	✓	opt.	opt.	✓	opt.	✓	✓
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.
Opt-3 AmpHigh	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.	opt.
Lic-3 NetIndustry	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
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.	✓	opt.	opt.	✓	opt.	opt.	✓	opt.	✓	✓

Opt-3 DC-EVR :

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.

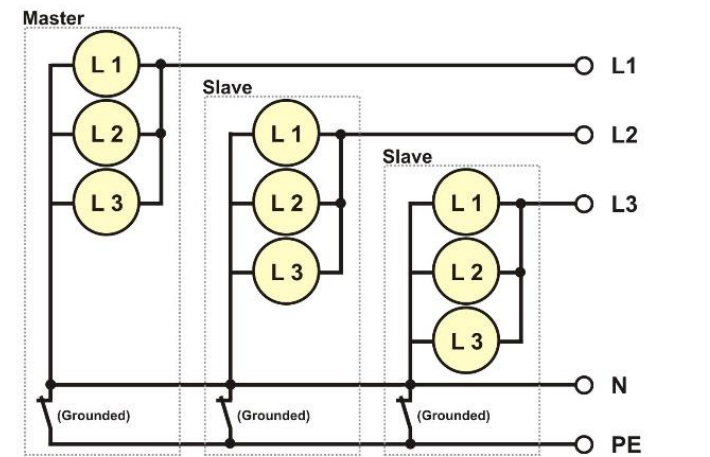


The following extended voltages can be reached :

- NetWave 20, 30, 67 :
425 VDC → 850 VDC
- NetWave 20.2, 30.2, 67.2, 90.2 :
500 VDC → 1'000 VDC
- NetWave 20.3, 30.3, 67.3, 90.3 :
560 VDC → 1'120 VDC

Opt-3 MS (MultiSource, 3 NetWave combined for high power AC source)

The option Opt-3 MS stands for Multi Source. With this option three NetWaves are put connected together to form a higher power three phase AC source. Each NetWave has to be equipped with the Opt-3 Parallel option and is put in parallel mode and acts as one phase. The three NetWaves are synchronized together with one acting as a Master and the other two as Slaves. With the master controlling the slaves the phase synchronization is guaranteed. The total output power is three times the power of the single NetWaves.



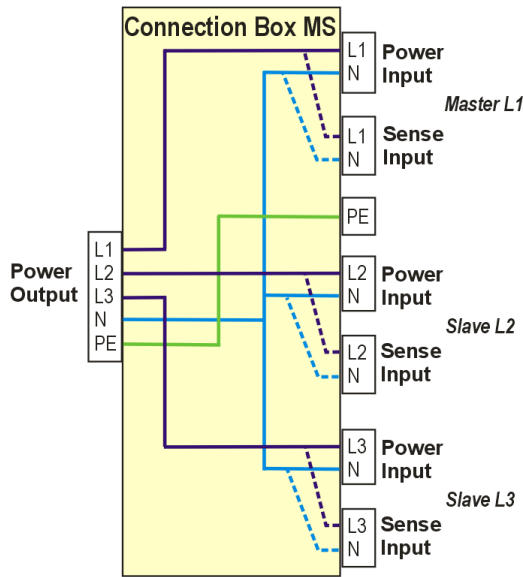
There are three MS options available:

	NetWave 20.x	NetWave 30.x	NetWave 67.x	NetWave 90
Opt-3 MS 20/30	x	X		
Opt-3 MS 67			X	
Opt-3 MS 90				X

The Opt-3 MS includes the following:

MultiSource Update FW	Update of Source Firmware with MultiSource/CascadeSource functionality
Framebus terminator inside	Remove inside the sources
Framebus terminator	3 x Framebus terminators
Emergency switch	Emergency switch with red button and 3 connectors
Control Cable	Control cable FrameBus, 4m + Control cable FrameBus 8m
Signal Cable	2 x BNC cable, 4m
Calibration	Calibration document

Connection Box MS Box with 3 sense connections, 3phase Input/Output, 5 power cable, 3 sense cables with connectors for connection of 3 NetWave in MultiSource

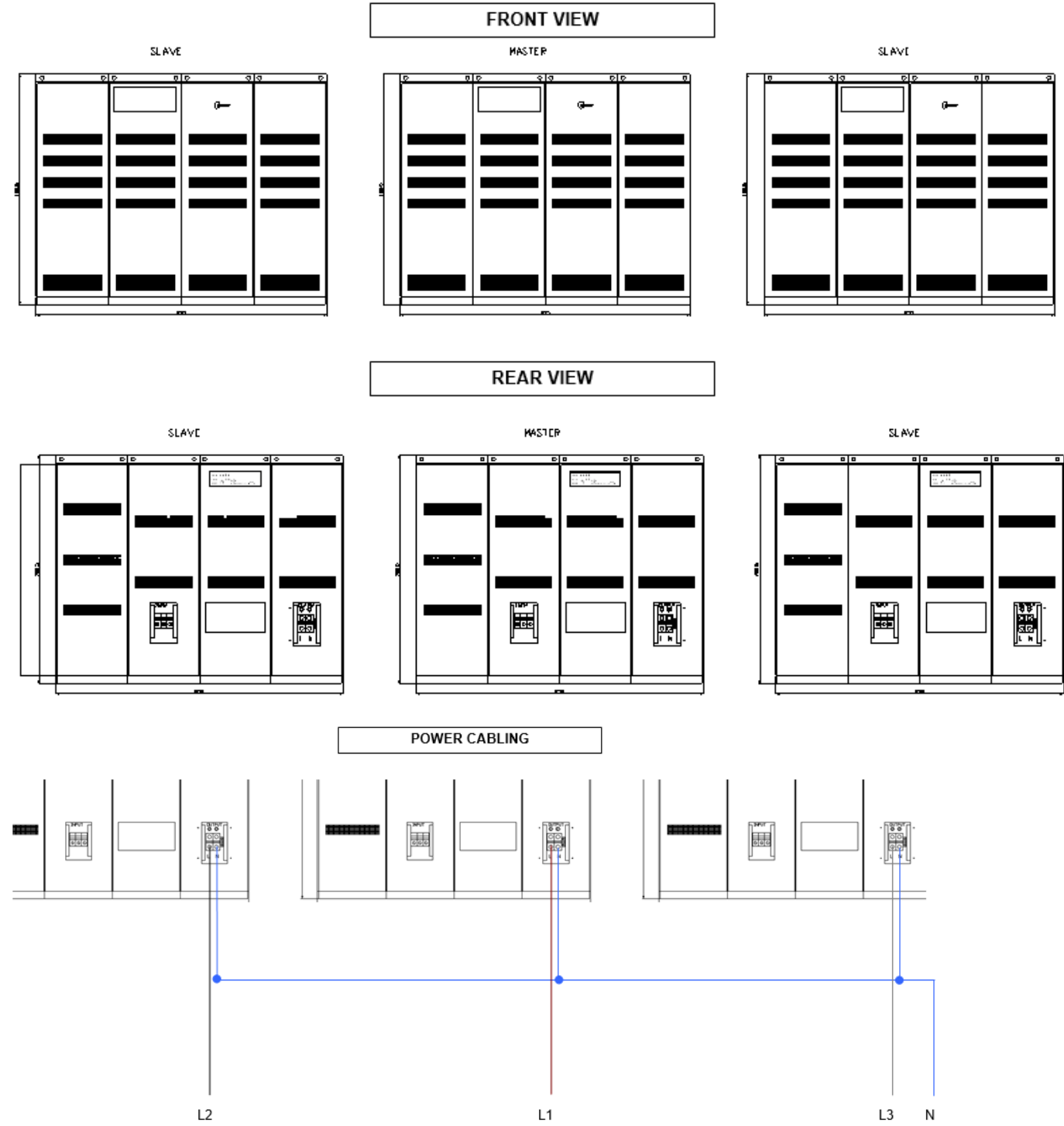


The connection box is included in the MS option and allows to connect the three outputs of the NetWaves together (Connection L1, L2, L3, N, PE and for each line sense).

Possible device configuration at Opt-3 MS :

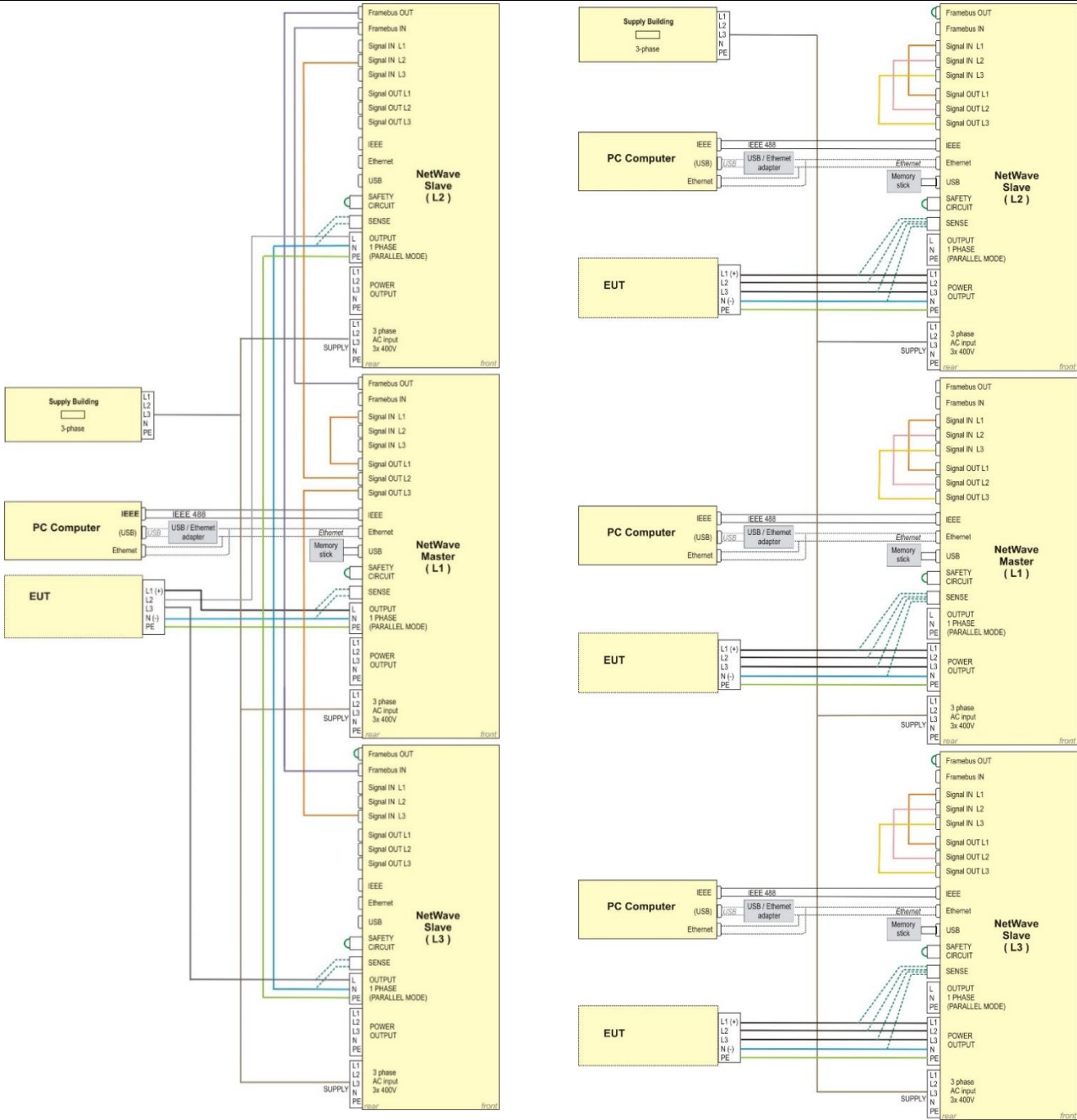
	MS = Multi Source, CS – Cascade Source											
	20 MS	20.2 MS	20.3 MS	30 MS	30.2 MS	30.3 MS	67 MS	67.2 MS	67.3 MS	90.2 MS	90.3 MS	108.3 MS
AC Voltage (L-N) – MS	300	360	400	300	360	400	300	360	400	360	400	400
AC Voltage (L-N) (Single Phase) – CS	600	720	800	600	720	800	600	720	800	720	800	800
DC Voltage – 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. 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	3x											
NetWave 20.2 with Opt-3 Parallel		3x										
NetWave 20.3 with Opt-3 Parallel			3x									
NetWave 30 with Opt-3 Parallel				3x								
NetWave 30.2 with Opt-3 Parallel					3x							
NetWave 30.3 with Opt-3 Parallel						3x						
NetWave 67 with Opt-3 Parallel							3x					
NetWave 67.2 with Opt-3 Parallel								3x				
NetWave 67.3 with Opt-3 Parallel									3x			
NetWave 90.2 with Opt-3 Parallel										3x		
NetWave 90.3 with Opt-3 Parallel											3x	
NetWave 108.3 with Opt-3 Parallel												3x
Opt-3 CS												✓
Opt-3 Recovery	opt.	opt.		opt.	opt.		opt.	opt.		opt.		✓
Enhanced Voltage Range at MS	not	not	not	not	not	not	not	not	not	not	not	not
Enhanced Voltage Range at CS	yes	yes	yes	yes	yes	yes	yes	yes	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.



3 NetWave in MultiSource

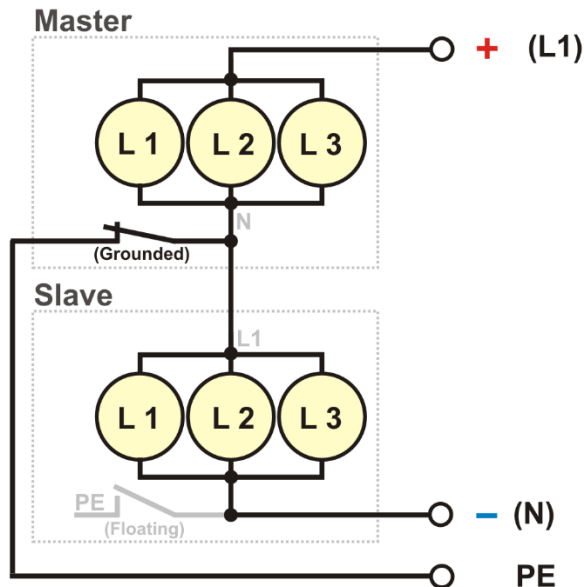
3 NetWaves in Standalone



Opt-3 CS (CascadeSource, 2 NetWave connected in series)

The option Opt-3 CS stands for Cascade Source. With this option two NetWaves are connected together to form a higher power one phase source (AC and DC).

Each NetWave has to be equipped with the Opt-3 Parallel option and is put in parallel mode. One NetWave forms the plus line and one the minus line. The combined output allows double voltage with higher power.

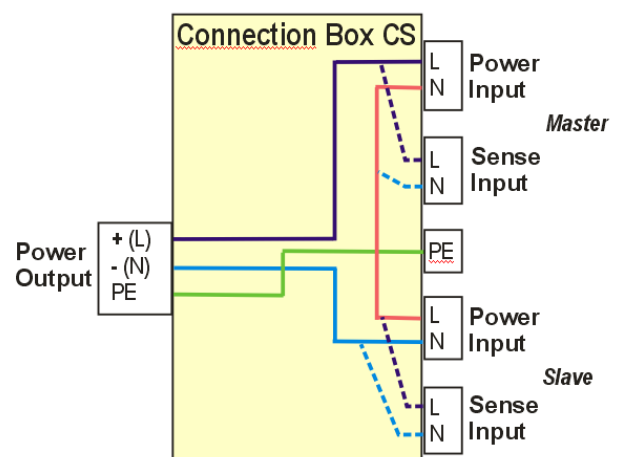


There are three CS options available:

	NetWave 20.x	NetWave 30.x	NetWave 67.x	NetWave 90
Opt-3 CS 20/30	x	X		
Opt-3 CS 67			X	
Opt-3 CS 90				X

The Opt-3 CS includes the following:

CascadeSource Update FW	Update of Source Firmware with CascadeSource functionality
Framebus terminator inside	Remove inside the sources
Framebus terminator	2 framebus terminators
Emergency switch	Emergency switch with red button and 2 connectors
Control Cable	Control cable FrameBus, 4m
Signal Cable	BNC cable, 4m, BNC T-adapter
Calibration	Calibration document
Connection box CS	Connection box with 2 sense connections, 1phase Input/Output, 6 power cable, 2 sense cables with connectors for connection of 2 NetWave 30 in CascadeSource



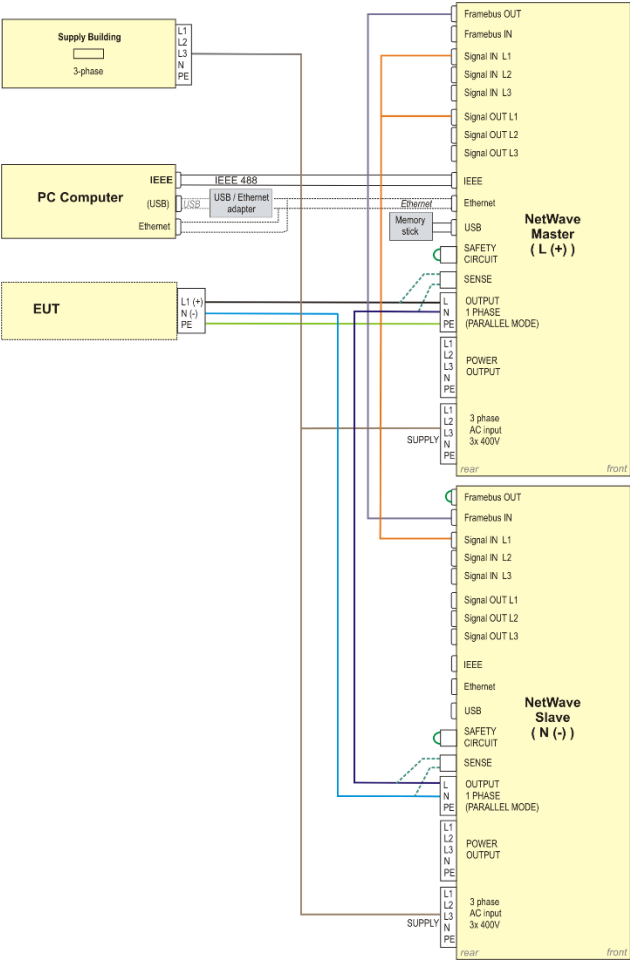
Possible device configuration at Opt-3 CS :

CS = CascadeSource

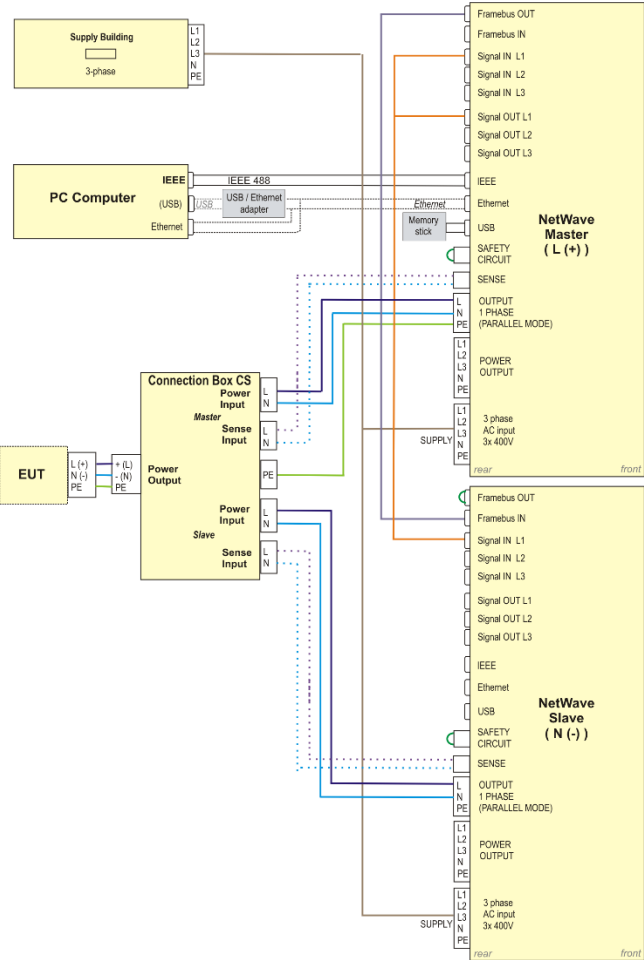
	20 CS	20.2 CS	20.3 CS	30 CS	30.2 CS	30.3 CS	67 CS	67.2 CS	67.3 CS	90.2 CS	90.3 CS	108.3 CS
AC Voltage (L-N) (Three Phase)	300	360	400	300	360	400	300	360	400	360	400	400
AC Voltage (L-N) (Single Phase)	600	720	800	600	720	800	600	720	800	720	800	800
DC Voltage	850	1000	1120	850	1000	1120	850	1000	1120	1000	1120	1120
Output Power AC (kVA) (Three Phase)	22.5	22.5	22.5	30	30	30	67	67	67	90	90	108
Output Power AC (kVA) (Single 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.

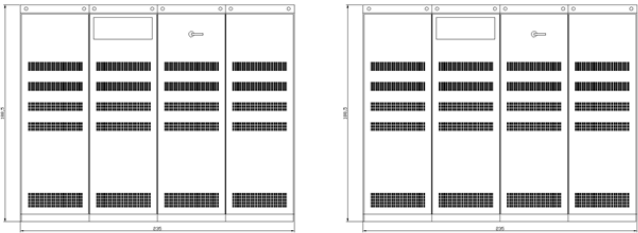
2 NetWave in CascadeSource



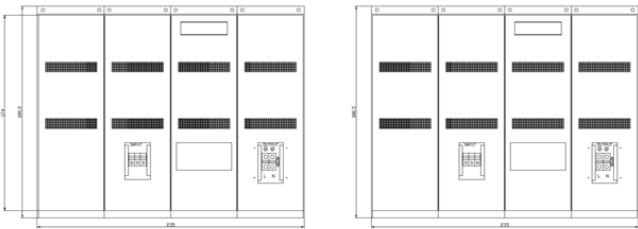
2 NetWave in CascadeSource + Connectionbox



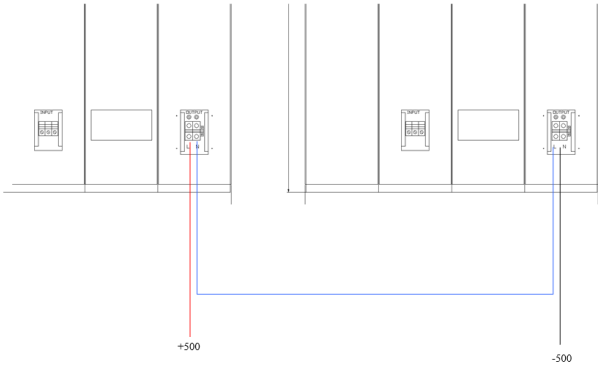
FRONT VIEW



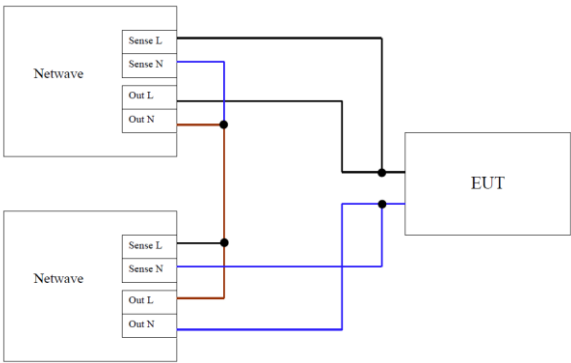
REAR VIEW



POWER CABLING



Sense Cabling



Description of the Features

Mode	Description
Standard	Mode which is used for Segment Power AC, Point Power AC, Point Period Power AC, Segment Power DC and Point Power DC Signals.
Simple	New NetWave controlling interface for AC tests. Simple test programming for NetWave integration in automated environments. The following segments are supported: • Sine • SineSweep • SineRamp • Sine3Phase • SineStep (additional Signal) In Simple Mode, automatic half period triggering at the start of a segment is possible. This setting can be selected per segment. In Simple Mode, any trigger events can be set for a trigger channel. In Simple Mode, gradual increase of the main line during switch-on can be selected, and respectively during switch-off a gradual decrease, in order to avoid test system oscillations. New segment „Segment step“ in Simple Mode. • With this new segment, voltage and/or frequency steps are possible with constant time steps. The maximum number of steps is limited to 100. • Following the last step, it can be determined for how long the last Voltage and Frequency should be applied. In addition, you can select at which phase angle the steps will be carried out. • The trigger signal can be activated at a step (can be pre-defined) or at each step. The duration of the trigger signal is $\frac{1}{2}$ a period. • The minimum step per frequency is 0.05 Hz and the minimum step per voltage is 0.02 Volt.
SourceAC	In this mode, the NetWave supports PLL synchronisation. This means that per synchronisation signal, the NetWave can be synchronised with another source. The NetWave serves as a source with fixed voltage and synchronised frequency. Frequency range: 40 Hz – 100Hz Response time: <5s PLL Input Duty Cycle: 50% $\pm$30% (20% - 80%) Output Jitter : < 0.5% Tracking interval: $\pm$10% of the programmed PLL centre frequency Phase error : -2°/+0°
External	“External” mode enables external control of the source. In this mode, external Sensing is also possible.

Point file converter (AC)

Converter for point power AC files, which converts automatically transferred time and data vectors to the required format, and prepares point files for playback.

Trigger channel

With point data files (Point Power AC and Point Period AC) any trigger events can be set for a trigger channel (trigger out 2).

Offset channel

The offset channel is used in Segment Mode for better accuracy off very small offsets requested by aircraft standards.

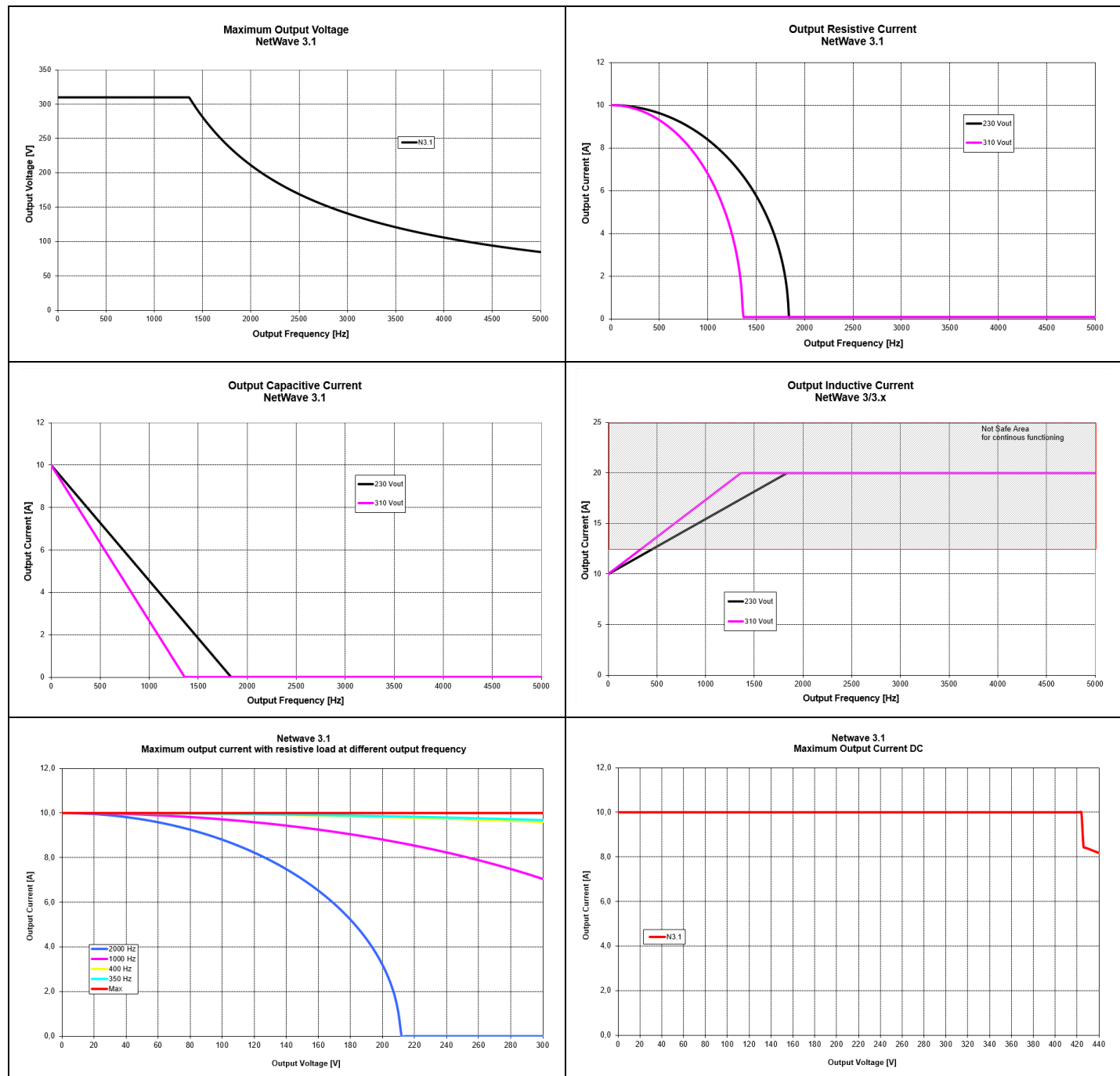
Simple controlling via Matlab (AC)

Automatic generation (e.g. with Matlab) of segment file is possible. For this the “Simple Mode” is used.

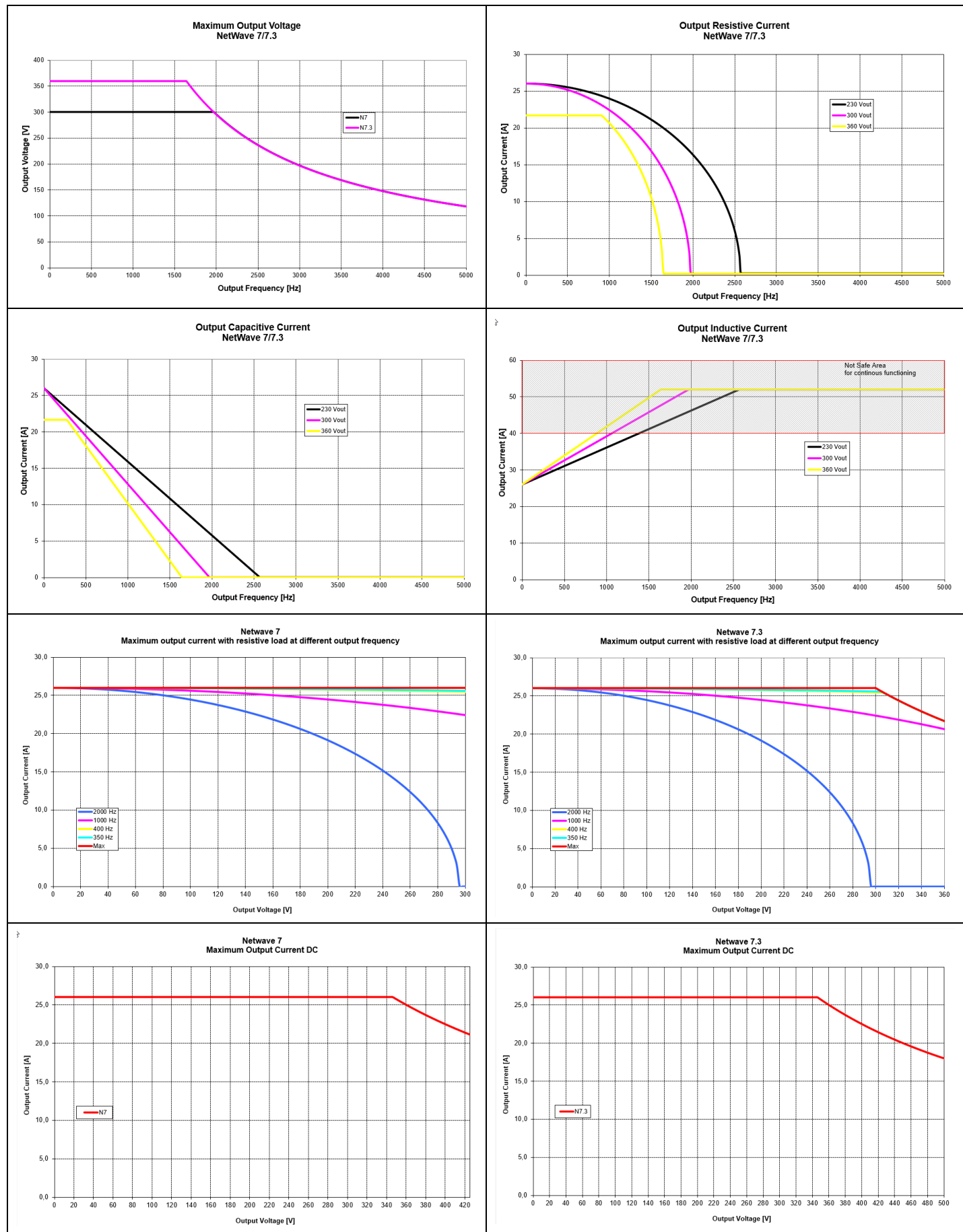
External sockets „Signal Output“ and “Source Input”

With this external sockets it is possible to connect an external signal generator and switch off the internal signal generator.

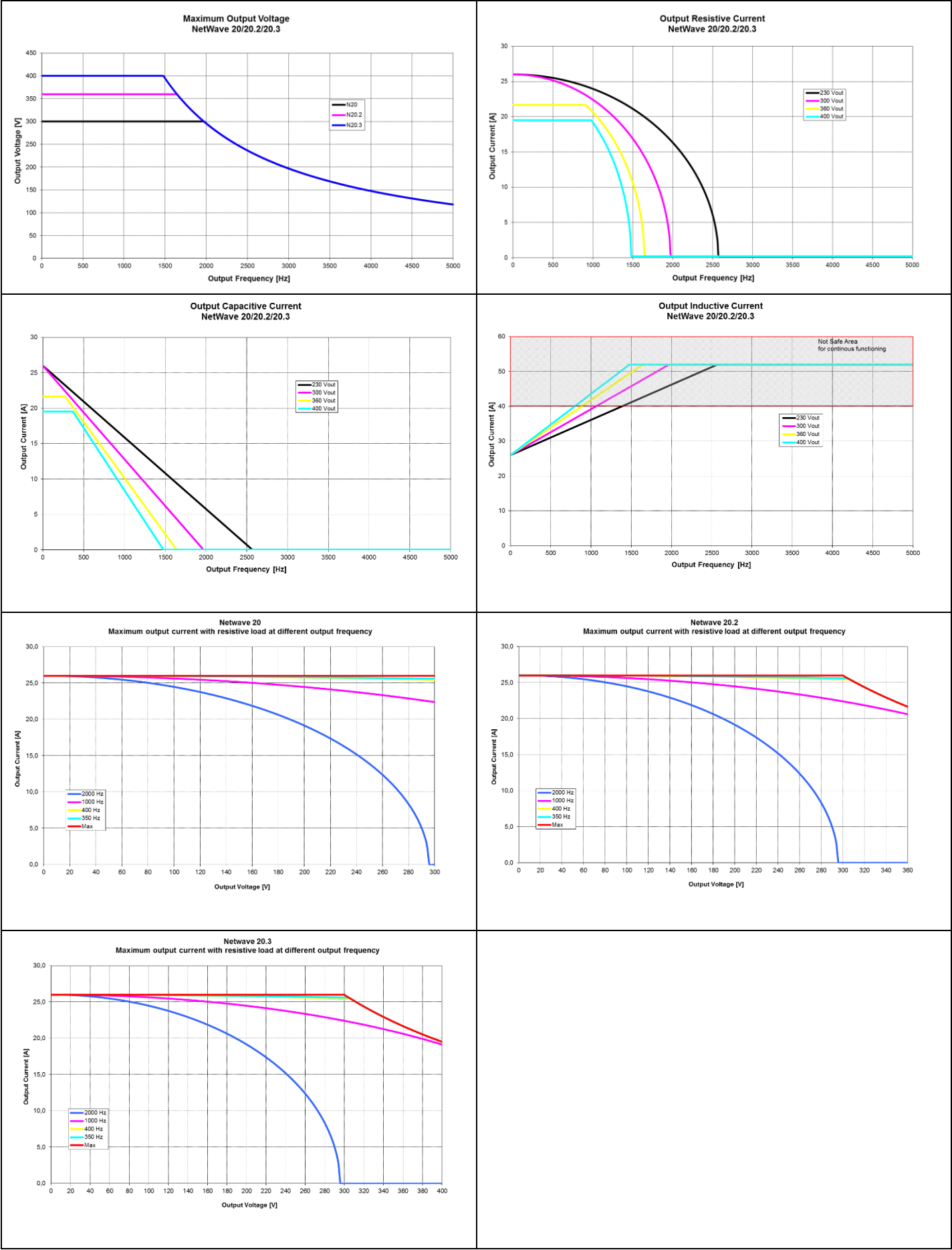
Graphs NetWave 3.1

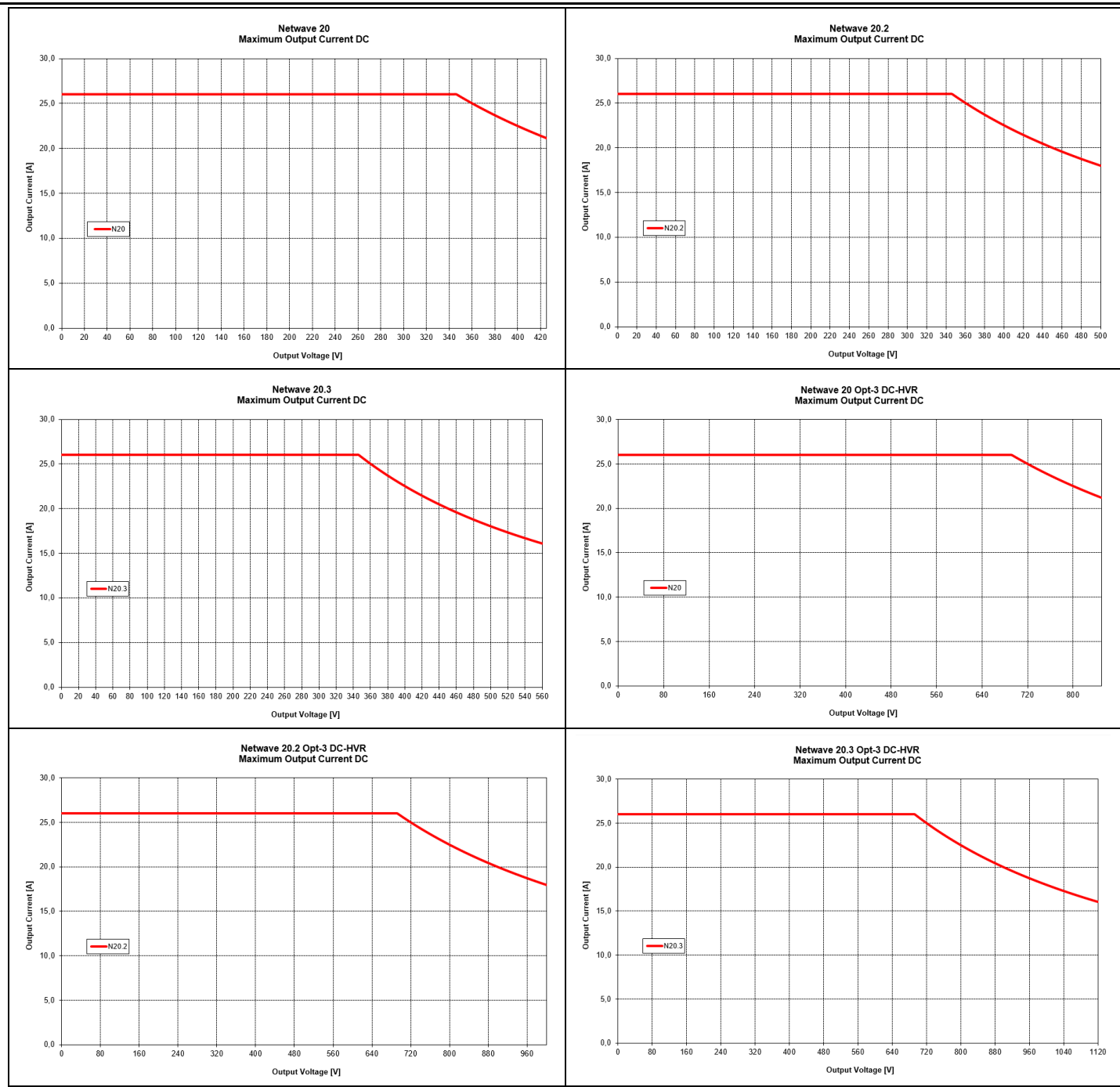


Graphs NetWave 7 / 7.3

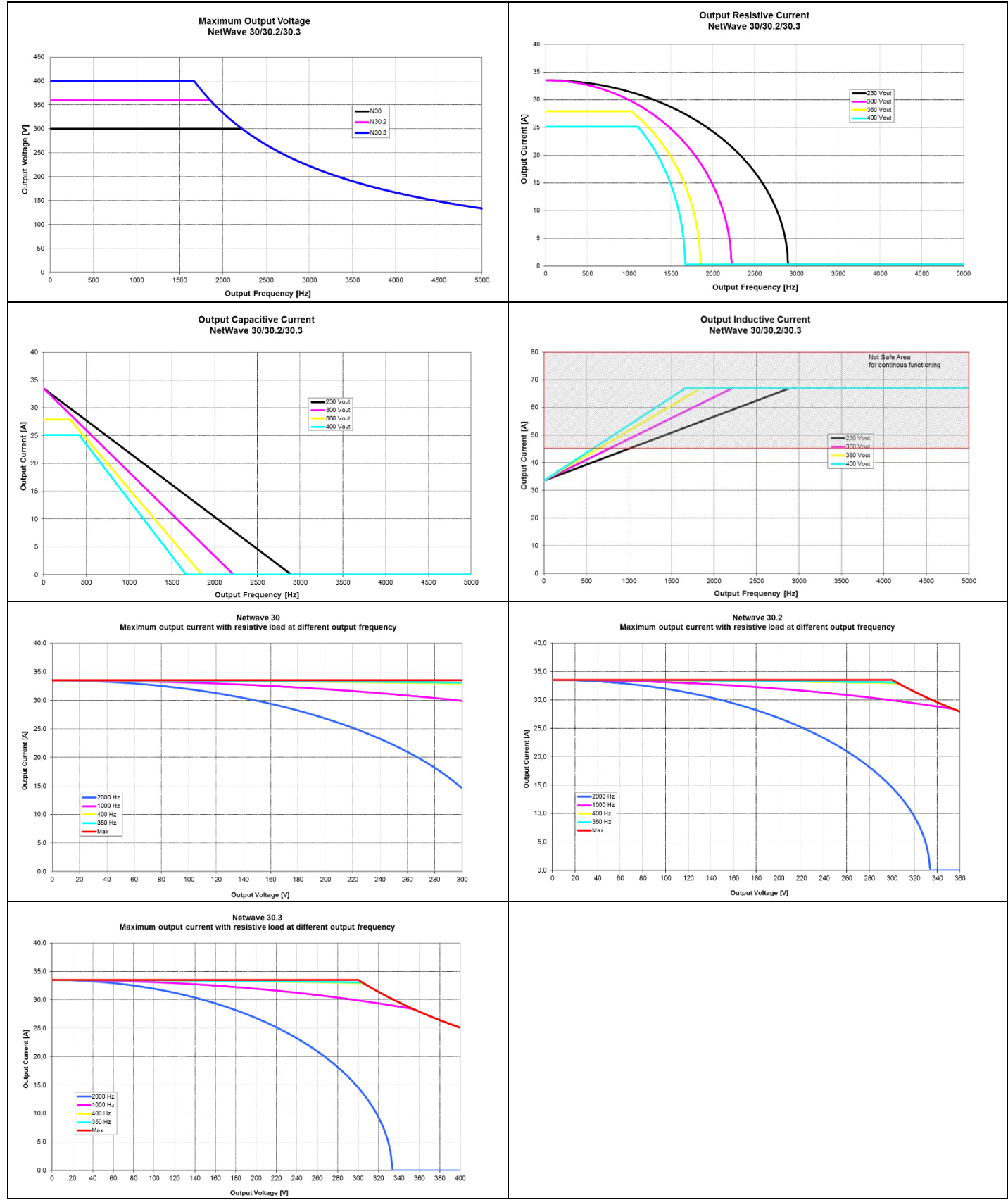


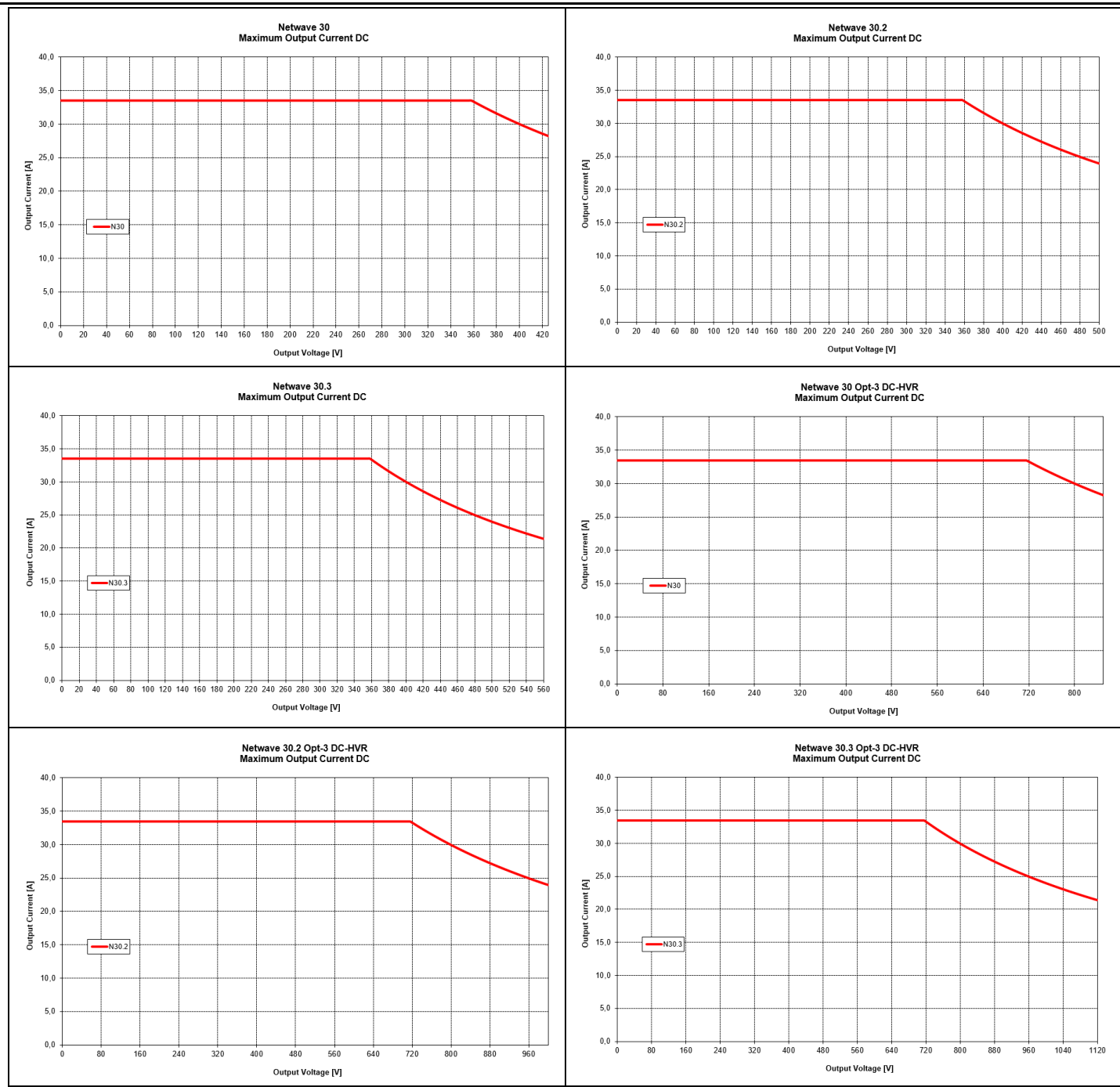
Graphs NetWave 20 / 20.2 / 20.3



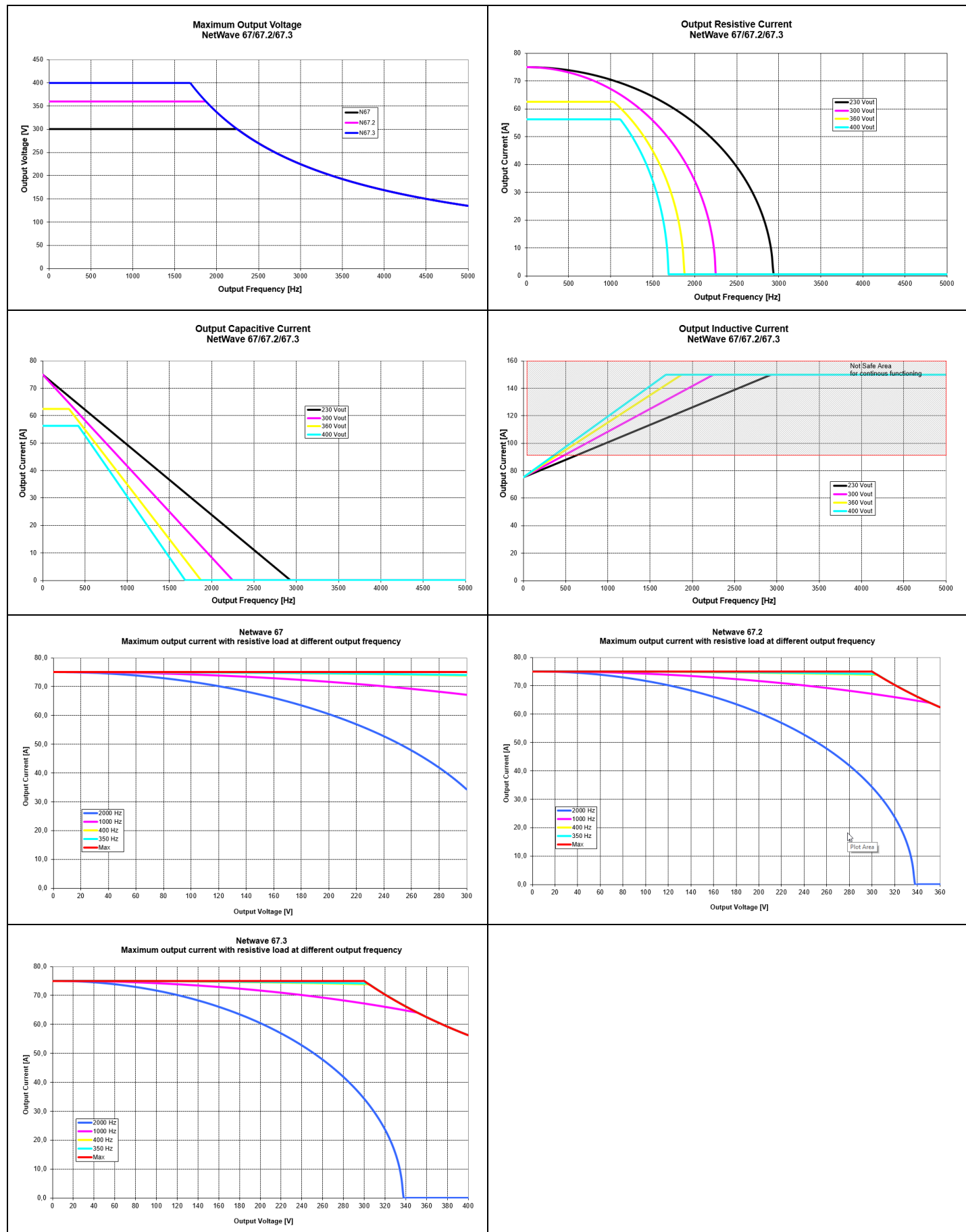


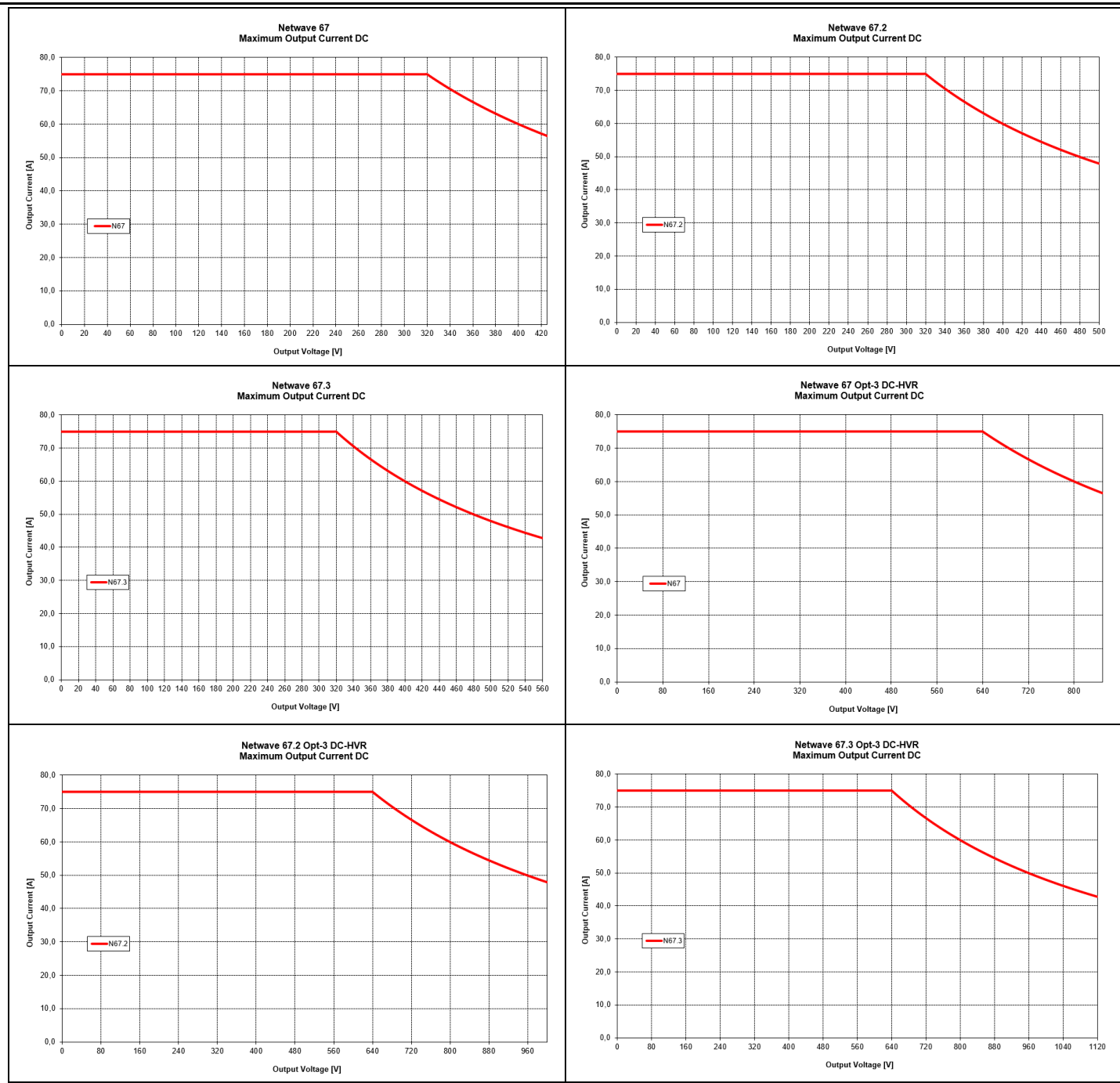
Graphs NetWave 30 / 30.2 / 30.3



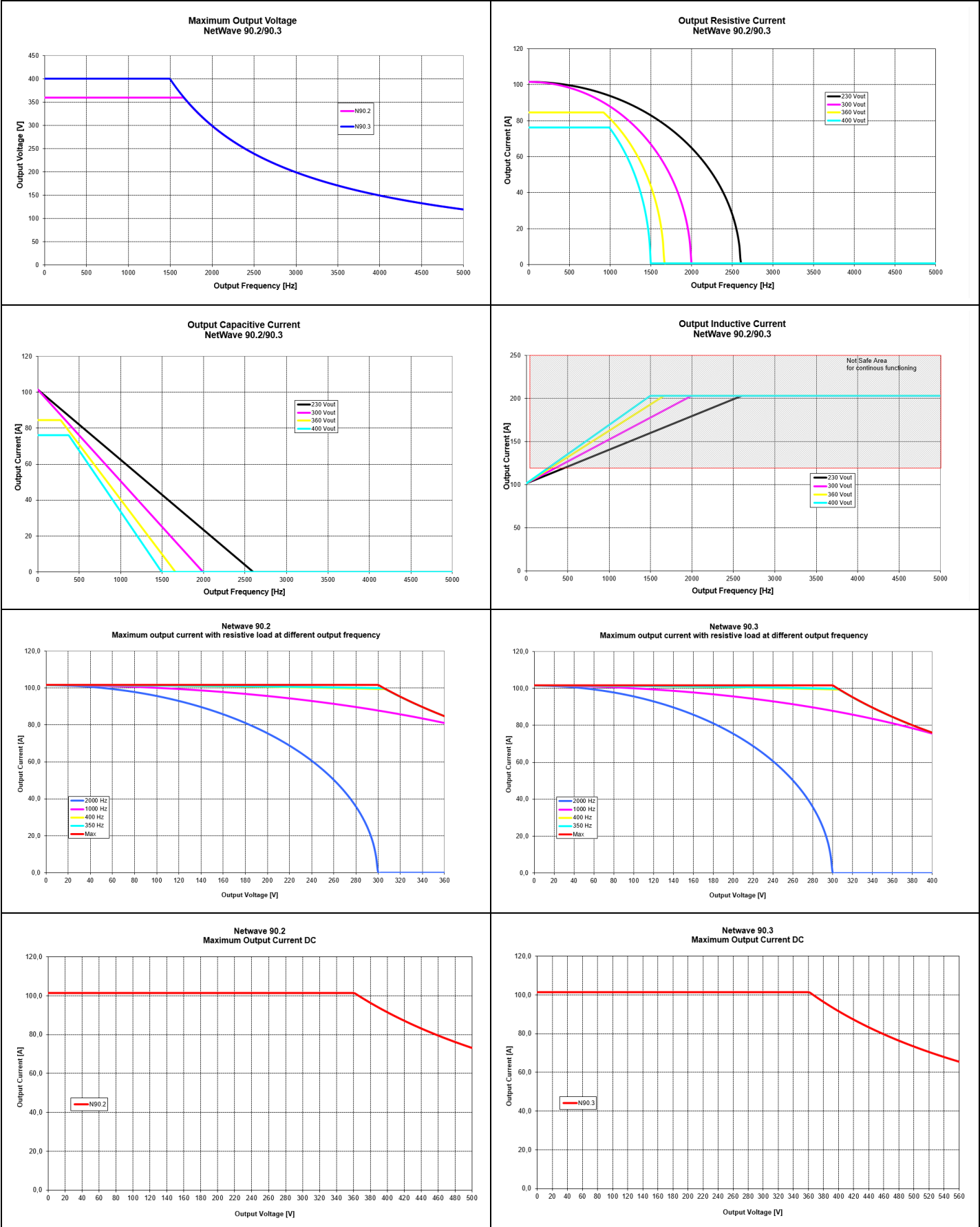


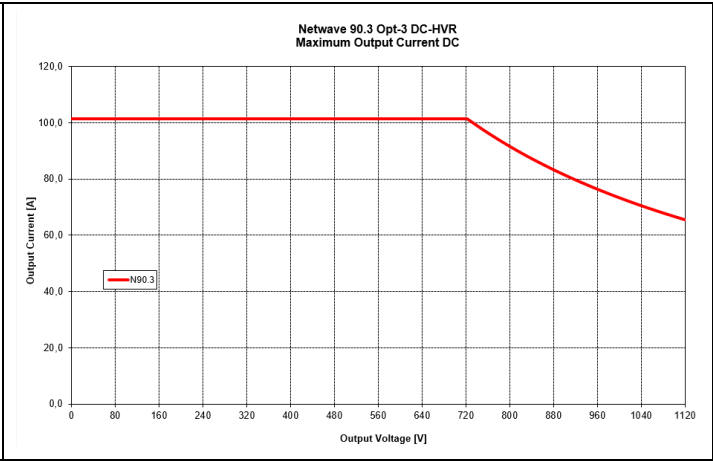
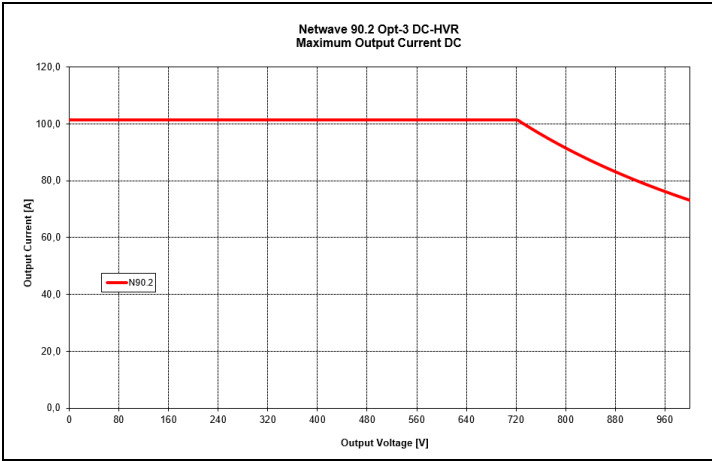
Graphs NetWave 67 / 67.2 / 67.3



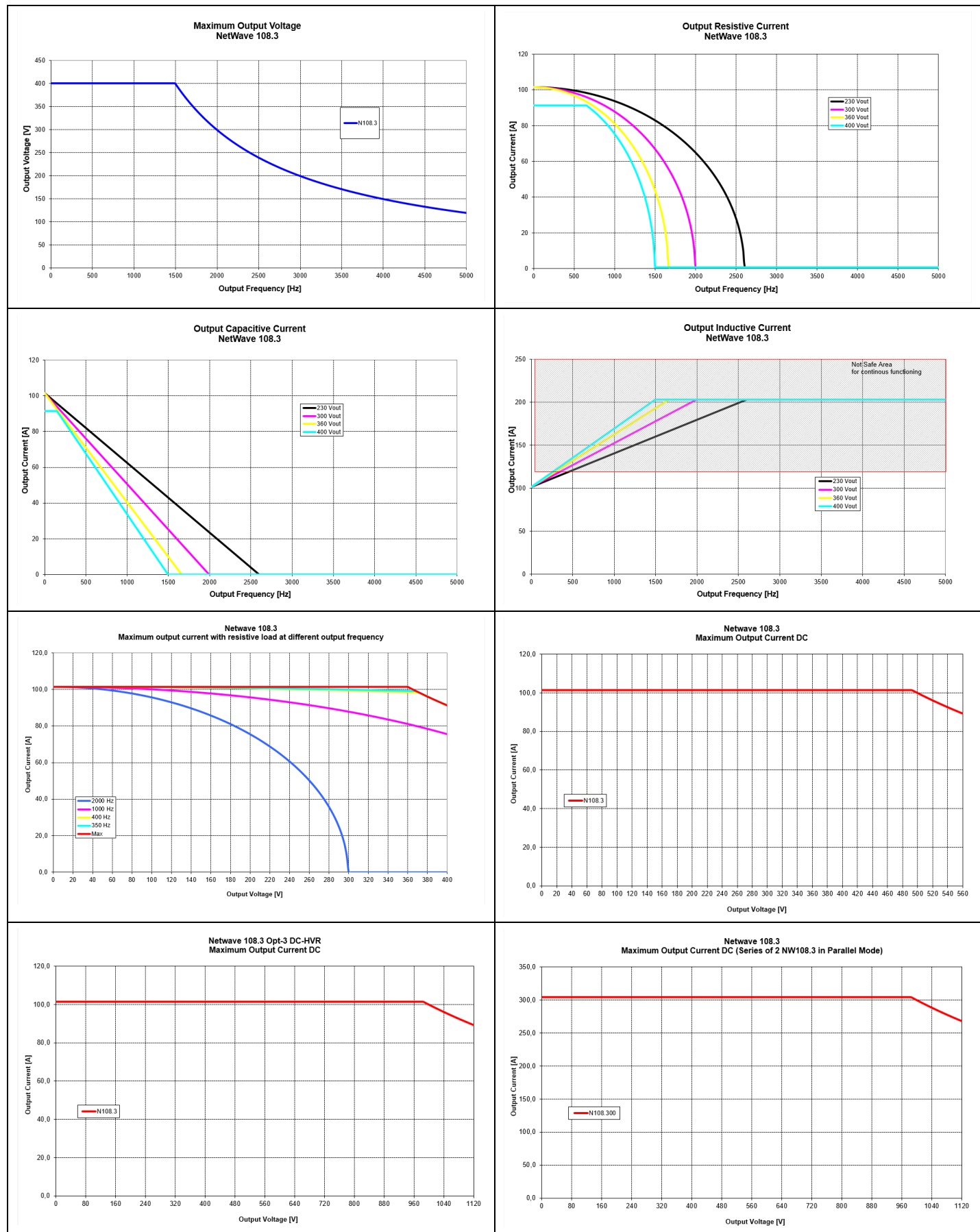


Graphs NetWave 90.2 / 90.3

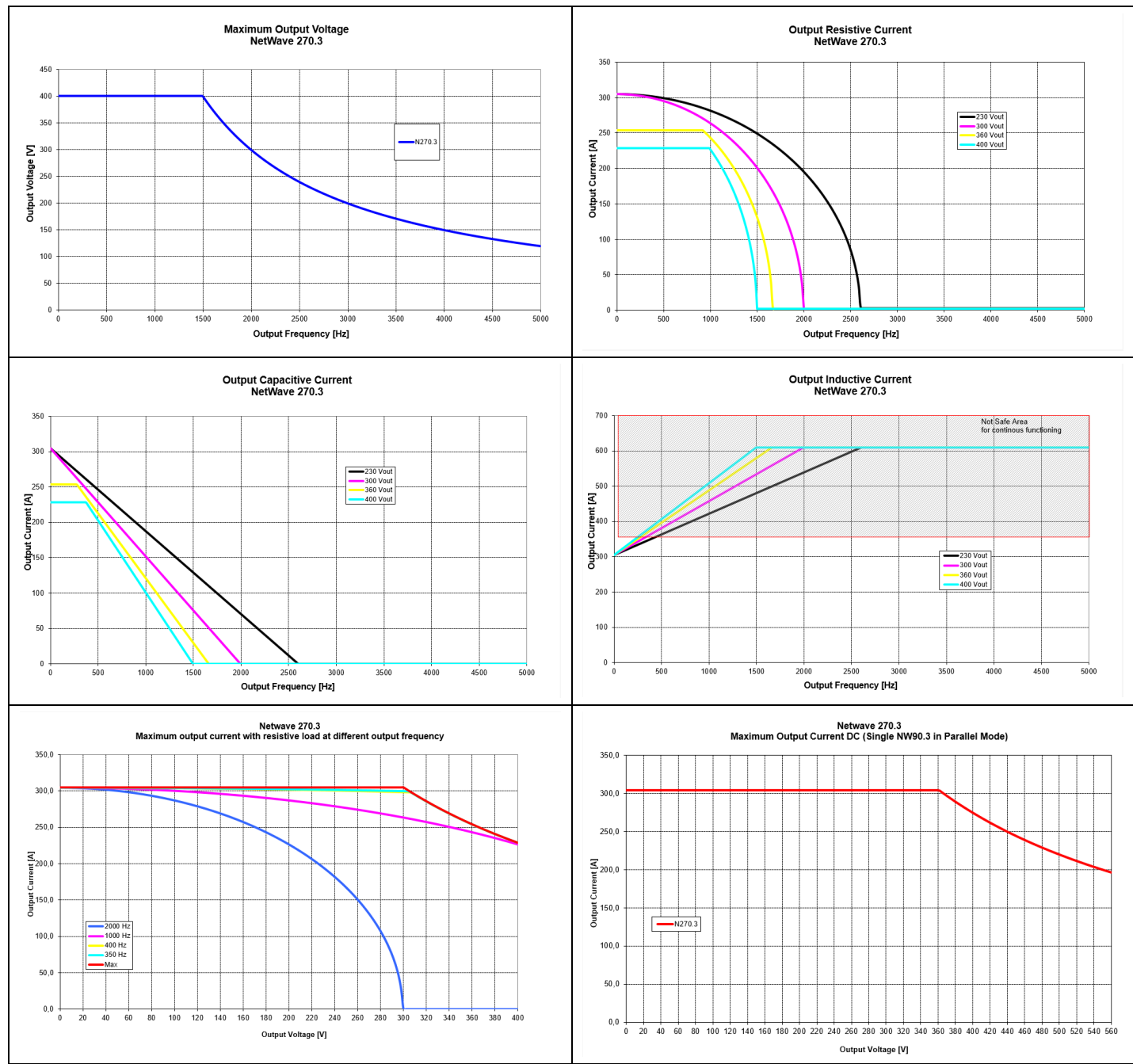




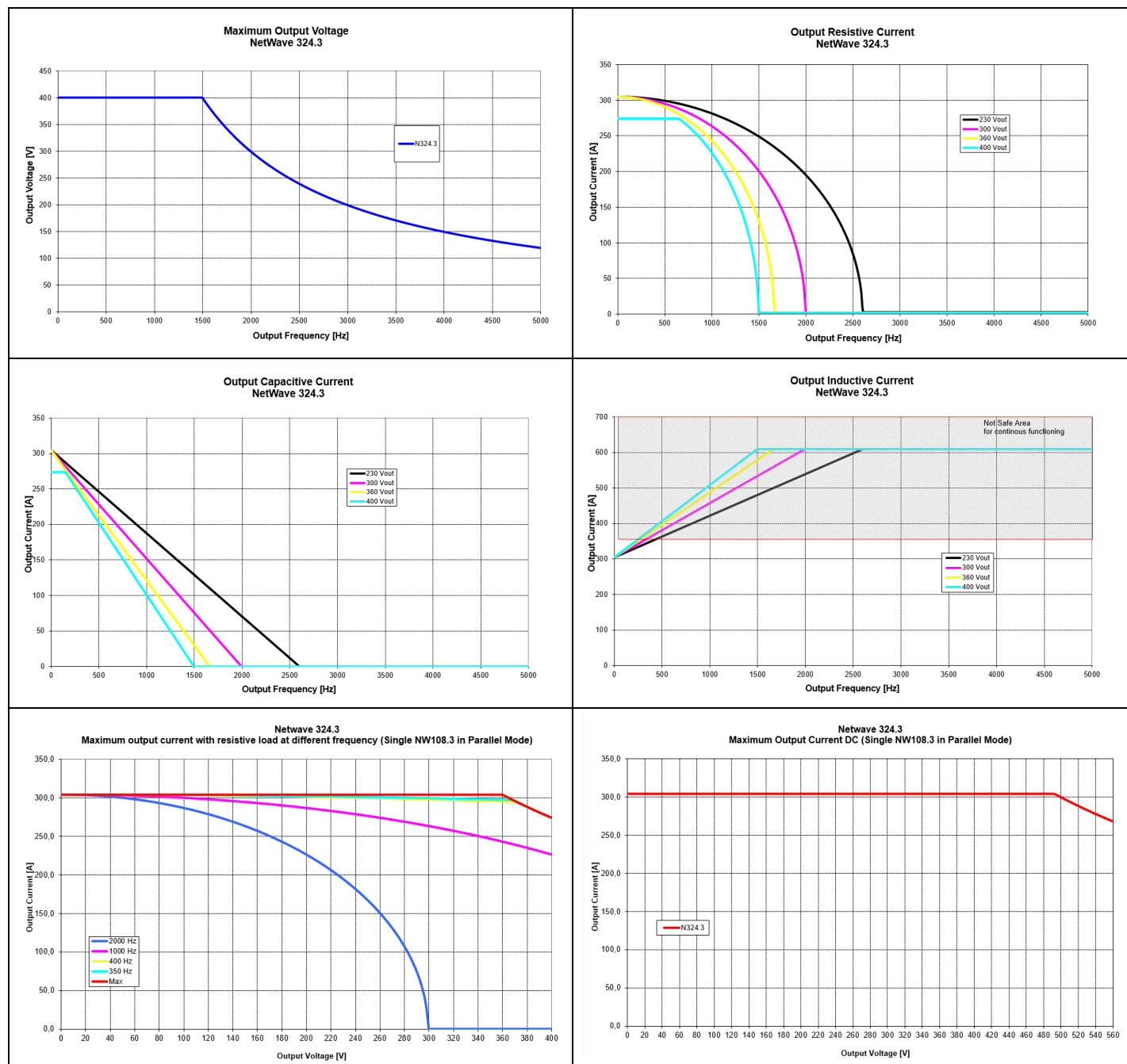
Graphs NetWave 108.3



Graphs NetWave 90.3MS



Graphs NetWave 108.3MS



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