

HIGHVOLT Prüftechnik Dresden GmbH

Marie-Curie-Straße 10
01139 Dresden, Germany
Phone +49 351 8425 700
Fax +49 351 8425 679
E-mail sales@highvolt.de
Website http://www.highvolt.de



Data Sheet 1.25/1

Electronic Power Source for Variable Output Voltage and Frequency, Type EPS

Application

The Electronic Power Sources, types EPS, are used as a low voltage power supply with a variable output of both voltage and frequency. They are mainly designed as a universal power supply for HIGHVOLT test systems in stationary and mobile applications. The Electronic Power Sources are available with two or three active output phases.

Principle

The heart of the EPS series is an active front-end rectifier and a power inverter (Fig. 1).

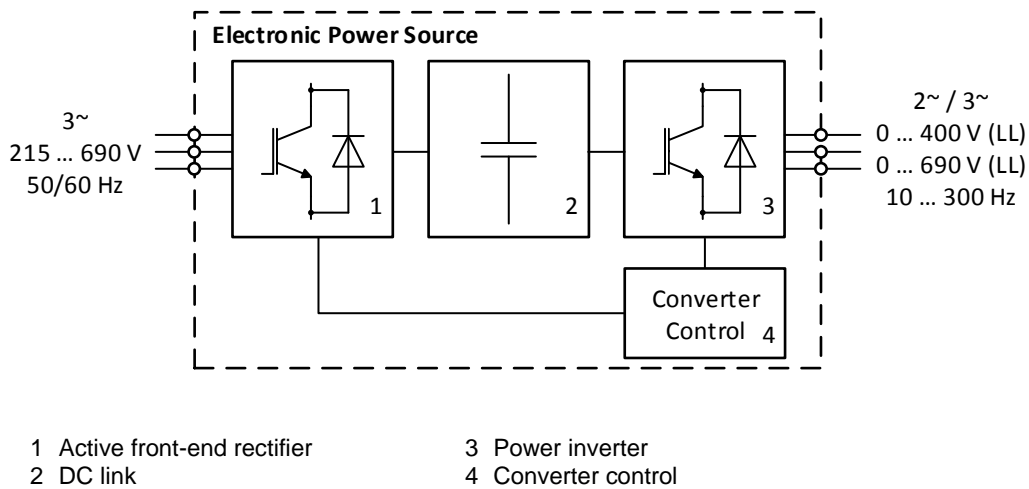


Fig. 1: Principle structure of the Electronic Power Source

Active front-end rectifier

The active front-end rectifier (AFE) synchronizes itself with the connected grid and supplies the DC-link circuit of the EPS with electricity. Despite a two-phase load, the AFE delivers a three-phase network load. Thanks to the fast response time, power supply fluctuations are compensated and thus decoupled from test circuit.

Power inverter

The power inverter uses pulse width modulation to generate a separate network for the connected test circuit. During operation it is possible to vary the voltage and frequency. The integrated filter performs two tasks, firstly, it generates a clean sine wave at the required frequency from the pulse pattern, and secondly it reduces medium or high-frequency disturbances to a minimum to enable highly sensitive PD measurements in accordance with IEC 60270. Due to this filter, the available output power of the converter depends on the output frequency and the power factor of the load (Fig. 2 to Fig. 24).

Converter control

The EPS is monitored and controlled by a control computer unit (CCU). The device receives the measured values for input and output voltage, currents, temperatures and status signals. With these data, the set points for the modulation of the AFE and power inverter are calculated in the control system. The hardware is protected with monitoring systems against overvoltage, overcurrent and over-temperature. Further functions such as harmonic compensation and DC current compensation increase the performance of the overall system. Within the power limit, the EPS can be operated as a voltage or current source; the current limiting function makes the EPS short-circuit-proof.

Design

The modular design of the EPS can be adapted to different power classes through parallel connection of the AFE and power inverter modules. By paralleling power inverter modules, the overall apparent power of the EPS can be increased. The same applies to the AFE modules. Paralleling these devices increases the available active power for the EPS.

Type designation: EPS-a b-c/d (a – output phase number, b – active output power [kW], c – apparent output power [kVA], d – output voltage [kV])

Table 1: Main parameters for EPS-3 40-40/0.4

Rated parameters			
Output power	3~ 40 kVA / 2~ 23 kVA		
Output active power	3~ 40 kW / 2~ 23 kW		
Voltage range (r.m.s)	3~ /2~ 40 ... 400 V		
Rated current (r.m.s)	57.7 A		
Rated frequency	50 / 60 Hz		
Output parameters			
Power factor range	0.2 _{cap} ...1...0.2 _{ind}		
Frequency range	10...300 Hz		
Power limit curve	See Fig. 2 and Fig. 3		
Output impedance: X ₁ , X ₃ , X ₅ , X ₇ , X ₉ at 50 – 150 – 250 - 350 – 450 Hz respectively		3~	2~
	x ₁	219 mΩ	438 mΩ
	x ₃	655 mΩ	1311 mΩ
	x ₅	1105 mΩ	2209 mΩ
	x ₇	1575 mΩ	3149 mΩ
	x ₉	2076 mΩ	4153 mΩ
THD of output voltage	<5 % * ¹⁾		
Power supply			
Voltage, three-phase	400 V ± 10 %, 50/60 Hz		
Power	63 kVA * ²⁾		
Interfaces for control			
Emergency-off & safety loop			
Operation voltage	230 V AC		
Contact for warning lamps			
Voltage / Current	230 V AC / max. 5A		
Cooling			
Method of cooling	forced-air cooling		
Sound pressure level			
	66 dB (A) at 4 m		
Dimensions, Environment			
Dimensions (WxHxD)	600 mm x 1620 mm x 655 mm		
Weight	190 kg		
Pollution degree acc. to IEC 60664-1, clause 4.5	2 * ³⁾		
Environmental conditions acc. to IEC 60721-3-3, clause 5	3K3/3B1/3C2/3S1/3M3 * ³⁾		

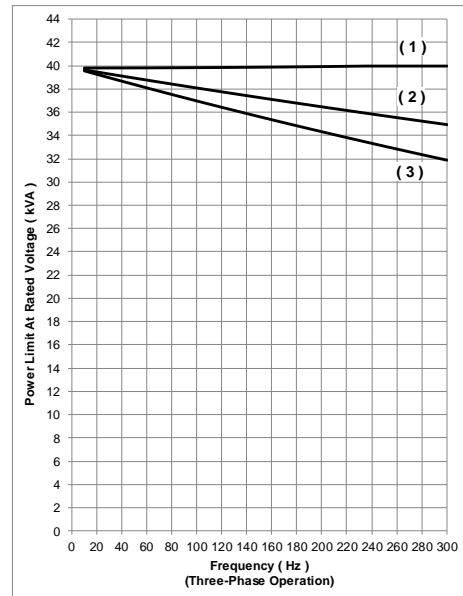
*¹⁾ – at rated output voltage of the EPS; The THD of output voltage is defined in following equation:

$$THD = \frac{\sqrt{\sum_{k=2}^9 (I_k X_k)^2}}{U_1}$$

At a specified fundamental output voltage (U_1), the THD of output voltage depends on the harmonic load current of the converter (I_k) and its output impedances (X_k);

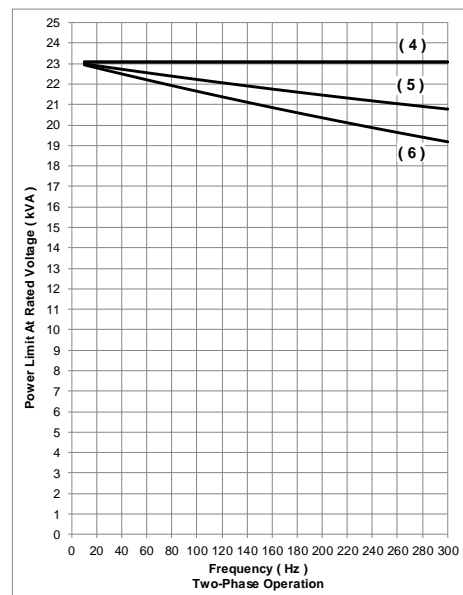
*²⁾ – short-circuit impedance of grid distribution transformer ≤ 4 % / sub-transient impedance of generator ≤ 0.1 Ω;

*³⁾ – see Appendix 1.



- (1) $\cos(\varphi) = 0 \dots 1.0$ (ohmic and inductive load);
 (2) $\cos(\varphi) = -0.8$ (capacitive load);
 (3) $\cos(\varphi) = -0.2$ (capacitive load)

Fig. 2: Three-phase output power as a function of test frequency at rated output voltage (parameter: power factor) for type EPS-3 40-40/0.4



- (4) $\cos(\varphi) = 0 \dots 1.0$ (ohmic and inductive load);
 (5) $\cos(\varphi) = -0.8$ (capacitive load);
 (6) $\cos(\varphi) = -0.2$ (capacitive load);

Fig. 3: Two-phase output power as a function of test frequency at rated output voltage (parameter: power factor) for type EPS-3 40-40/0.4

Type designation: EPS-3 80-170/0.4 (a – output phase number, b – active output power [kW], c – apparent output power [kVA], d – output voltage [kV])

Table 2: Main parameters for EPS-3 80-170/0.4

Rated parameters			
Output power	3~ 170 kVA /2~ 100 kVA		
Output active power	3~ /2~ 80 kW		
Voltage range (r.m.s)	3~ /2~ 40 ... 400 V		
Rated current (r.m.s)	250 A		
Rated frequency	50 / 60 Hz		
Output parameters			
Power factor range	0.2 _{cap} ...1...0.2 _{ind}		
Frequency range	10...300 Hz		
Power limit curve	See Fig. 4 and Fig. 5		
Output impedance: X ₁ , X ₃ , X ₅ , X ₇ , X ₉ at 50 – 150 – 250 - 350 – 450 Hz respectively		3~	2~
	X ₁	65 mΩ	130 mΩ
	X ₃	190 mΩ	379 mΩ
	X ₅	317 mΩ	634 mΩ
	X ₇	447 mΩ	894 mΩ
	X ₉	581 mΩ	1161 mΩ
THD of output voltage	<5 % * ⁴⁾		
Power supply			
Voltage, three-phase	400 V ± 10 %, 50/60 Hz		
Power	125 kVA * ⁵⁾		
Interfaces for control			
Emergency-off & safety loop			
Operation voltage	230 V AC		
Contact for warning lamps			
Voltage / Current	230 V AC / max. 5A		
Cooling			
Method of cooling	forced-air cooling		
Sound pressure level			
	66 dB (A) at 4 m		
Dimensions, Environment			
Dimensions (WxHxD)	600 mm x 2200 mm x 600 mm		
Weight	600 kg		
Pollution degree acc. to IEC 60664-1, clause 4.5	2 * ⁶⁾		
Environmental conditions acc. to IEC 60721-3-3, clause 5	3K3/3B1/3C2/3S1/3M3 * ⁶⁾		

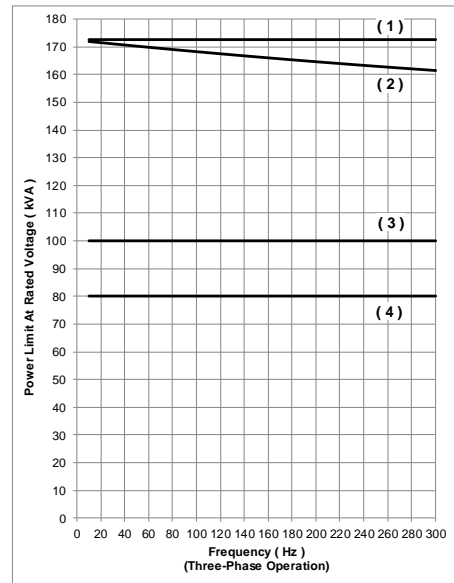
*⁴⁾ – at rated output voltage of the EPS; The THD of output voltage is defined in following equation:

$$THD = \frac{\sqrt{\sum_{k=2}^9 (I_k X_k)^2}}{U_1}$$

At a specified fundamental output voltage (U_1), the THD of output voltage depends on the harmonic load current of the converter (I_k) and its output impedances (X_k);

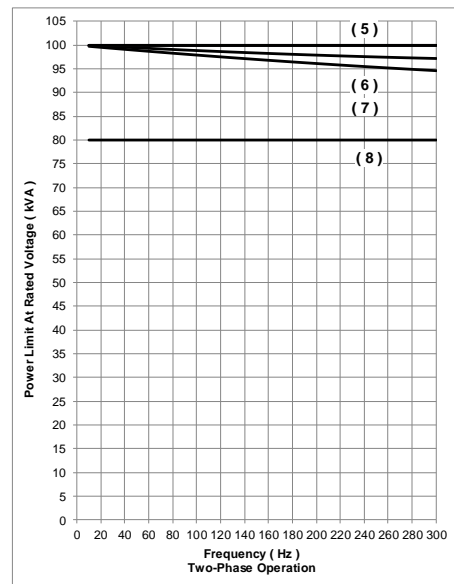
*⁵⁾ –short-circuit impedance of grid distribution transformer ≤ 4 % / sub-transient impedance of generator ≤ 0.05 Ω;

*⁶⁾ –see Appendix 1.



- (1) $\cos(\varphi) = +0 \dots 0.46$ (inductive load);
- (2) $\cos(\varphi) = -0.2$ (capacitive load);
- (3) $\cos(\varphi) = \pm 0.8$ (inductive or capacitive load);
- (4) $\cos(\varphi) = 1.0$ (ohmic load)

Fig. 4: Three-phase output power as a function of test frequency at rated output voltage (parameter: power factor) for type EPS-3 80-170/0.4



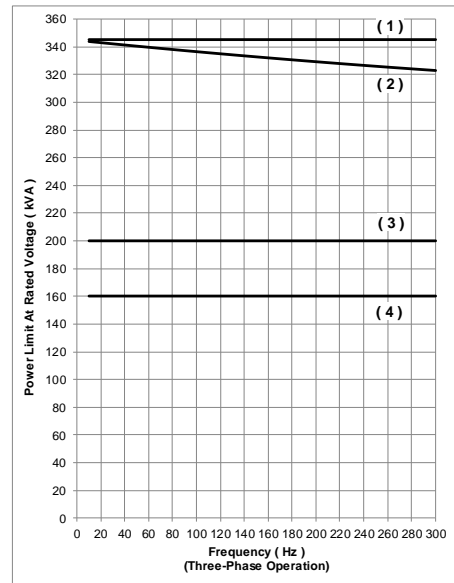
- (5) $\cos(\varphi) = +0 \dots 0.8$ (inductive load);
- (6) $\cos(\varphi) = -0.8$ (capacitive load);
- (7) $\cos(\varphi) = -0.2$ (capacitive load);
- (8) $\cos(\varphi) = 1.0$ (ohmic load)

Fig. 5: Two-phase output power as a function of test frequency at rated output voltage (parameter: power factor) for type EPS-3 80-170/0.4

Type designation: EPS-3 160-345/0.4 (a – output phase number, b – active output power [kW], c – apparent output power [kVA], d – output voltage [kV])

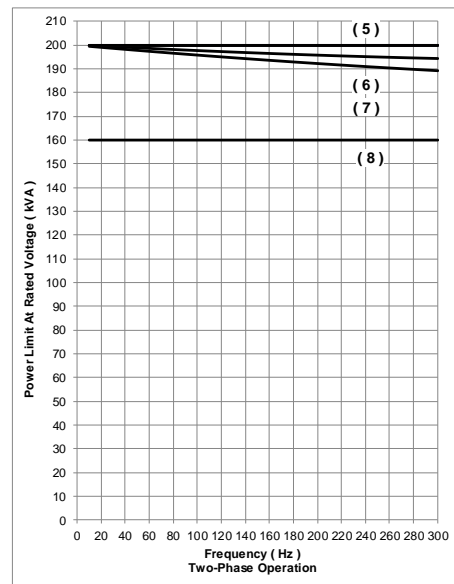
Table 3: Main parameters for EPS-3 160-345/0.4

Rated parameters			
Output power	3~ 345 kVA /2~ 200 kVA		
Output active power	3~ /2~ 160 kW		
Voltage range (r.m.s)	3~ /2~ 40 ... 400 V		
Rated current (r.m.s)	500 A		
Rated frequency	50 / 60 Hz		
Output parameters			
Power factor range	0.2 _{cap} ...1...0.2 _{ind}		
Frequency range	10...300 Hz		
Power limit curve	See Fig. 6 and Fig. 7		
Output impedance: X ₁ , X ₃ , X ₅ , X ₇ , X ₉ at 50 – 150 – 250 - 350 – 450 Hz respectively		3~	2~
	X ₁	32 mΩ	65 mΩ
	X ₃	95 mΩ	190 mΩ
	X ₅	159 mΩ	317 mΩ
	X ₇	224 mΩ	447 mΩ
	X ₉	290 mΩ	581 mΩ
THD of output voltage	<5 % ^{*7)}		
Power supply			
Voltage, three-phase	400 V ± 10 %, 50/60 Hz		
Power	250 kVA ^{*8)}		
Interfaces for control			
Emergency-off & safety loop			
Operation voltage	230 V AC		
Contact for warning lamps			
Voltage / Current	230 V AC / max. 5A		
Cooling			
Method of cooling	forced-air cooling		
Sound pressure level			
	66 dB (A) at 4 m		
Dimensions, Environment			
Dimensions (WxHxD)	1200 mm x 2200 mm x 600 mm		
Weight	1200 kg		
Pollution degree acc. to IEC 60664-1, clause 4.5	2 ^{*9)}		
Environmental conditions acc. to IEC 60721-3-3, clause 5	3K3/3B1/3C2/3S1/3M3 ^{*9)}		



- (1) $\cos(\varphi) = +0 \dots 0.46$ (inductive load);
- (2) $\cos(\varphi) = -0.2$ (capacitive load);
- (3) $\cos(\varphi) = \pm 0.8$ (inductive or capacitive load);
- (4) $\cos(\varphi) = 1.0$ (ohmic load)

Fig. 6: Three-phase output power as a function of test frequency at rated output voltage (parameter: power factor) for type EPS-3 160-345/0.4



- (5) $\cos(\varphi) = +0 \dots 0.8$ (inductive load);
- (6) $\cos(\varphi) = -0.8$ (capacitive load);
- (7) $\cos(\varphi) = -0.2$ (capacitive load);
- (8) $\cos(\varphi) = 1.0$ (ohmic load)

Fig. 7: Two-phase output power as a function of test frequency at rated output voltage (parameter: power factor) for type EPS-3 160-345/0.4

^{*7)} – at rated output voltage of the EPS; The THD of output voltage is defined in following equation:

$$THD = \frac{\sqrt{\sum_{k=2}^9 (I_k X_k)^2}}{U_1}$$

At a specified fundamental output voltage (U_1), the THD of output voltage depends on the harmonic load current of the converter (I_k) and its output impedances (X_k);

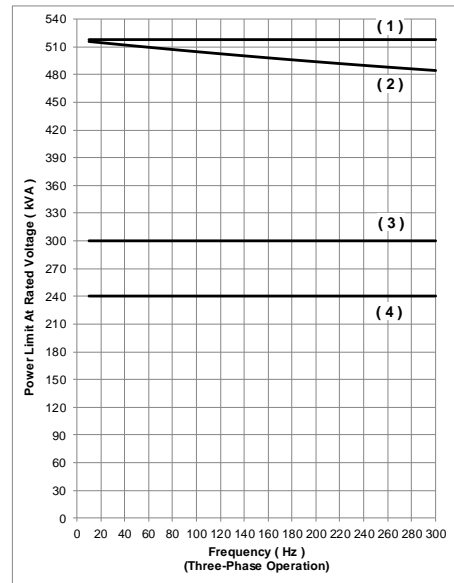
^{*8)} –short-circuit impedance of grid distribution transformer ≤ 4 % / sub-transient impedance of generator ≤ 0.025 Ω;

^{*9)} –see Appendix 1.

Type designation: EPS-3 240-520/0.4 (a – output phase number, b – active output power [kW], c – apparent output power [kVA], d – output voltage [kV])

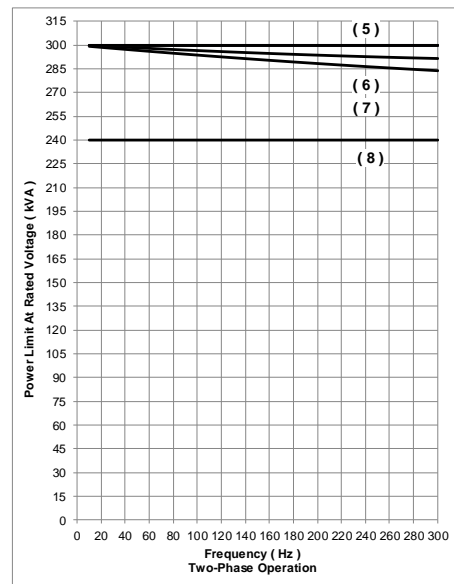
Table 4: Main parameters for EPS-3 240-520/0.4

Rated parameters			
Output power	3~ 520 kVA /2~ 300 kVA		
Output active power	3~ /2~ 240 kW		
Voltage range (r.m.s)	3~ /2~ 40 ... 400 V		
Rated current (r.m.s)	750 A		
Rated frequency	50 / 60 Hz		
Output parameters			
Power factor range	0.2 _{cap} ...1...0.2 _{ind}		
Frequency range	10...300 Hz		
Power limit curve	See Fig. 8 and Fig. 9		
Output impedance: X ₁ , X ₃ , X ₅ , X ₇ , X ₉ at 50 – 150 – 250 - 350 – 450 Hz respectively		3~	2~
	X ₁	22 mΩ	43 mΩ
	X ₃	63 mΩ	126 mΩ
	X ₅	106 mΩ	211 mΩ
	X ₇	149 mΩ	298 mΩ
	X ₉	194 mΩ	387 mΩ
THD of output voltage	<5 % ^{*10)}		
Power supply			
Voltage, three-phase	400 V ± 10 %, 50/60 Hz		
Power	315 kVA ^{*11)}		
Interfaces for control			
Emergency-off & safety loop			
Operation voltage	230 V AC		
Contact for warning lamps			
Voltage / Current	230 V AC / max. 5A		
Cooling			
Method of cooling	forced-air cooling		
Sound pressure level			
	66 dB (A) at 4 m		
Dimensions, Environment			
Dimensions (WxHxD)	1800 mm x 2200 mm x 600 mm		
Weight	1800 kg		
Pollution degree acc. to IEC 60664-1, clause 4.5	2 ^{*12)}		
Environmental conditions acc. to IEC 60721-3-3, clause 5	3K3/3B1/3C2/3S1/3M3 ^{*12)}		



- (1) $\cos(\varphi) = +0 \dots 0.46$ (inductive load);
- (2) $\cos(\varphi) = -0.2$ (capacitive load);
- (3) $\cos(\varphi) = \pm 0.8$ (inductive or capacitive load);
- (4) $\cos(\varphi) = 1.0$ (ohmic load)

Fig. 8: Three-phase output power as a function of test frequency at rated output voltage (parameter: power factor) for type EPS-3 240-520/0.4



- (5) $\cos(\varphi) = +0 \dots 0.8$ (inductive load);
- (6) $\cos(\varphi) = -0.8$ (capacitive load);
- (7) $\cos(\varphi) = -0.2$ (capacitive load);
- (8) $\cos(\varphi) = 1.0$ (ohmic load)

Fig. 9: Two-phase output power as a function of test frequency at rated output voltage (parameter: power factor) for type EPS-3 240-520/0.4

^{*10)} – at rated output voltage of the EPS; The THD of output voltage is defined in following equation:

$$THD = \frac{\sqrt{\sum_{k=2}^9 (I_k X_k)^2}}{U_1}$$

At a specified fundamental output voltage (U_1), the THD of output voltage depends on the harmonic load current of the converter (I_k) and its output impedances (X_k);

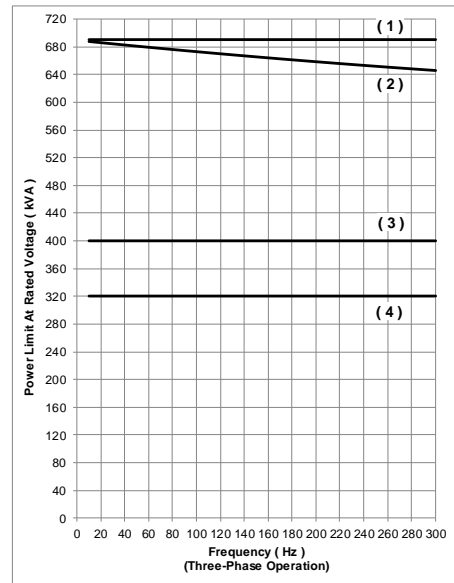
^{*11)} –short-circuit impedance of grid distribution transformer $\leq 4\%$ / sub-transient impedance of generator $\leq 0.02\ \Omega$;

^{*12)} –see Appendix 1.

Type designation: EPS-3 320-690/0.4 (a – output phase number, b – active output power [kW], c – apparent output power [kVA], d – output voltage [kV])

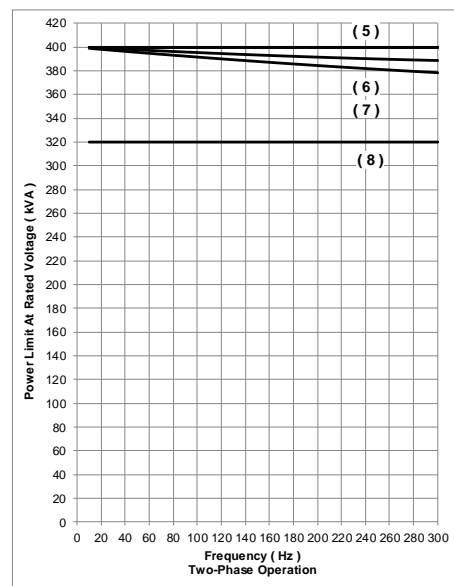
Table 5: Main parameters for EPS-3 320-690/0.4

Rated parameters			
Output power	3~ 690 kVA /2~ 400 kVA		
Output active power	3~ / 2~ 320 kW		
Voltage range (r.m.s)	3~ /2~ 40 ... 400 V		
Rated current (r.m.s)	1000 A		
Rated frequency	50 / 60 Hz		
Output parameters			
Power factor range	0.2 _{cap} ...1...0.2 _{ind}		
Frequency range	10...300 Hz		
Power limit curve	See Fig. 10 and Fig. 11		
Output impedance: X ₁ , X ₃ , X ₅ , X ₇ , X ₉ at 50 – 150 – 250 - 350 – 450 Hz respectively		3~	2~
	x ₁	16 mΩ	32 mΩ
	x ₃	47 mΩ	95 mΩ
	x ₅	79 mΩ	159 mΩ
	x ₇	112 mΩ	224 mΩ
	x ₉	145 mΩ	290 mΩ
THD of output voltage	<5 % * ¹³⁾		
Power supply			
Voltage, three-phase	400 V ± 10 %, 50/60 Hz		
Power	400 kVA * ¹⁴⁾		
Interfaces for control			
Emergency-off & safety loop			
Operation voltage	230 V AC		
Contact for warning lamps			
Voltage / Current	230 V AC / max. 5A		
Cooling			
Method of cooling	forced-air cooling		
Sound pressure level			
	66 dB (A) at 4 m		
Dimensions, Environment			
Dimensions (WxHxD)	2400 mm x 2200 mm x 600 mm		
Weight	2400 kg		
Pollution degree acc. to IEC 60664-1, clause 4.5	2 * ¹⁵⁾		
Environmental conditions acc. to IEC 60721-3-3, clause 5	3K3/3B1/3C2/3S1/3M3 * ¹⁵⁾		



- (1) $\cos(\varphi) = +0 \dots 0.46$ (inductive load);
- (2) $\cos(\varphi) = -0.2$ (capacitive load);
- (3) $\cos(\varphi) = \pm 0.8$ (inductive or capacitive load);
- (4) $\cos(\varphi) = 1.0$ (ohmic load)

Fig. 10: Three-phase output power as a function of test frequency at rated output voltage (parameter: power factor) for type EPS-3 320-690/0.4



- (5) $\cos(\varphi) = +0 \dots 0.8$ (inductive load);
- (6) $\cos(\varphi) = -0.8$ (capacitive load);
- (7) $\cos(\varphi) = -0.2$ (capacitive load);
- (8) $\cos(\varphi) = 1.0$ (ohmic load)

Fig. 11: Two-phase output power as a function of test frequency at rated output voltage (parameter: power factor) for type EPS-3 320-690/0.4

*¹³⁾ – at rated output voltage of the EPS; The THD of output voltage is defined in following equation:

$$THD = \frac{\sqrt{\sum_{k=2}^9 (I_k X_k)^2}}{U_1}$$

At a specified fundamental output voltage (U_1), the THD of output voltage depends on the harmonic load current of the converter (I_k) and its output impedances (X_k);

*¹⁴⁾ –short-circuit impedance of grid distribution transformer ≤ 4 % / sub-transient impedance of generator ≤ 0.016 Ω;

*¹⁵⁾ –see Appendix 1.

Type designation: EPS-3 400-690/0.4 (a – output phase number, b – active output power [kW], c – apparent output power [kVA], d – output voltage [kV])

Table 6: Main parameters for EPS-3 400-690/0.4

Rated parameters			
Output power	3~ 690 kVA / 2~ 400 kVA		
Output active power	3~ / 2~ 400 kW		
Voltage range (r.m.s)	3~ / 2~ 40 ... 400 V		
Rated current (r.m.s)	1000 A		
Rated frequency	50 / 60 Hz		
Output parameters			
Power factor range	0.2 _{cap} ...1...0.2 _{ind}		
Frequency range	10...300 Hz		
Power limit curve	See Fig. 12 and Fig. 13		
Output impedance: X ₁ , X ₃ , X ₅ , X ₇ , X ₉ at 50 – 150 – 250 - 350 – 450 Hz respectively		3~	2~
	x ₁	16 mΩ	32 mΩ
	x ₃	47 mΩ	95 mΩ
	x ₅	79 mΩ	159 mΩ
	x ₇	112 mΩ	224 mΩ
	x ₉	145 mΩ	290 mΩ
THD of output voltage	<5 % ^{*16)}		
Power supply			
Voltage, three-phase	400 V ± 10 %, 50/60 Hz		
Power	500 kVA ^{*17)}		
Interfaces for control			
Emergency-off & safety loop			
Operation voltage	230 V AC		
Contact for warning lamps			
Voltage / Current	230 V AC / max. 5A		
Cooling			
Method of cooling	forced-air cooling		
Sound pressure level			
	66 dB (A) at 4 m		
Dimensions, Environment			
Dimensions (WxHxD)	2400 mm x 2200 mm x 600 mm		
Weight	2520 kg		
Pollution degree acc. to IEC 60664-1, clause 4.5	2 ^{*18)}		
Environmental conditions acc. to IEC 60721-3-3, clause 5	3K3/3B1/3C2/3S1/3M3 ^{*18)}		

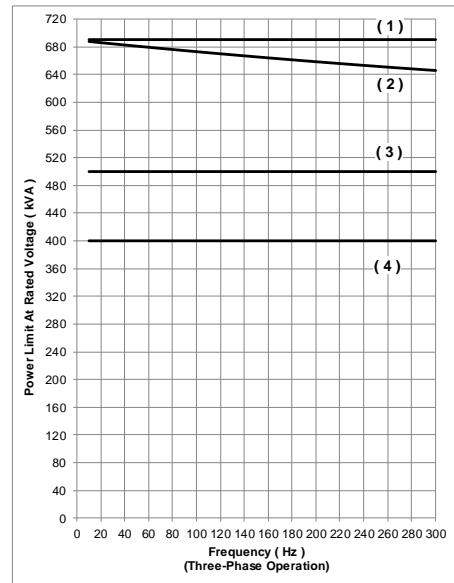
^{*16)} – at rated output voltage of the EPS; The THD of output voltage is defined in following equation:

$$THD = \frac{\sqrt{\sum_{k=2}^9 (I_k X_k)^2}}{U_1}$$

At a specified fundamental output voltage (U_1), the THD of output voltage depends on the harmonic load current of the converter (I_k) and its output impedances (X_k);

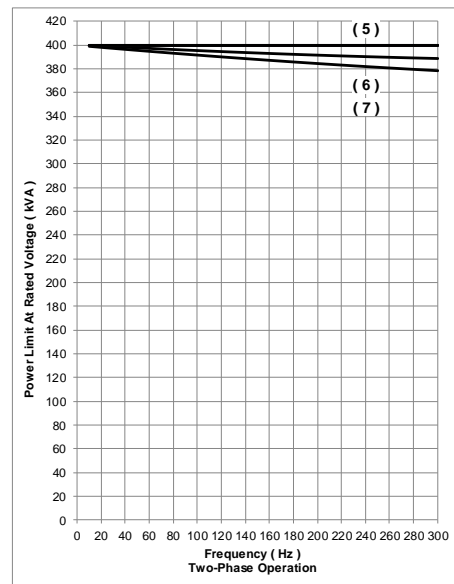
^{*17)} –short-circuit impedance of grid distribution transformer ≤ 4 % / sub-transient impedance of generator ≤ 0.013 Ω;

^{*18)} –see Appendix 1.



- (1) $\cos(\varphi) = +0 \dots 0.58$ (inductive load);
- (2) $\cos(\varphi) = -0.2$ (capacitive load);
- (3) $\cos(\varphi) = \pm 0.8$ (inductive or capacitive load);
- (4) $\cos(\varphi) = 1.0$ (ohmic load)

Fig. 12: Three-phase output power as a function of test frequency at rated output voltage (parameter: power factor) for type EPS-3 400-690/0.4



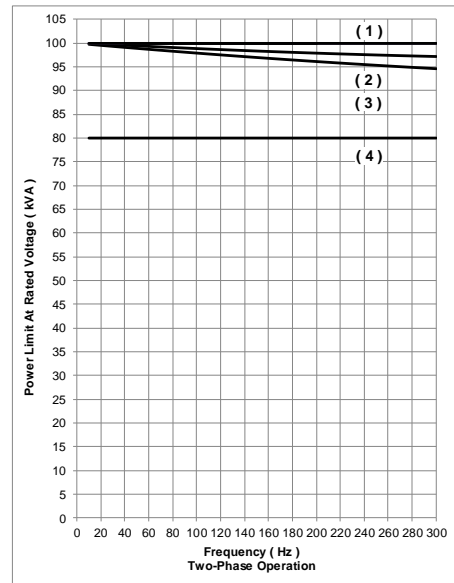
- (5) $\cos(\varphi) = +0 \dots 1$ (inductive and ohmic load);
- (6) $\cos(\varphi) = -0.8$ (capacitive load);
- (7) $\cos(\varphi) = -0.2$ (capacitive load);

Fig. 13: Two-phase output power as a function of test frequency at rated output voltage (parameter: power factor) for type EPS-3 400-690/0.4

Type designation: EPS-2 80-100/0.4 (a – output phase number, b – active output power [kW], c – apparent output power [kVA], d – output voltage [kV])

Table 7: Main parameters for EPS-2 80-100/0.4

Rated parameters	
Output power	100 kVA
Output active power	80 kW
Voltage range (r.m.s)	2~ 40 ... 400 V
Rated current (r.m.s)	250 A
Rated frequency	50 / 60 Hz
Output parameters	
Power factor range	0.2 _{cap} ...1...0.2 _{ind}
Frequency range	10...300 Hz
Power limit curve	See Fig. 14
Output impedance: X ₁ , X ₃ , X ₅ , X ₇ , X ₉ at 50 – 150 – 250 - 350 – 450 Hz respectively	2~
	X ₁ 130 mΩ
	X ₃ 379 mΩ
	X ₅ 634 mΩ
	X ₇ 894 mΩ
X ₉ 1161 mΩ	
THD of output voltage	<5 % * ¹⁹⁾
Power supply	
Voltage, three-phase	400 V ± 10 %, 50/60 Hz
Power	125 kVA * ²⁰⁾
Interfaces for control	
Emergency-off & safety loop	
Operation voltage	230 V AC
Contact for warning lamps	
Voltage / Current	230 V AC / max. 5A
Cooling	
Method of cooling	forced-air cooling
Sound pressure level	
	66 dB (A) at 4 m
Dimensions, Environment	
Dimensions (WxHxD)	600 mm x 2200 mm x 600 mm
Weight	530 kg
Pollution degree acc. to IEC 60664-1, clause 4.5	2 * ²¹⁾
Environmental conditions acc. to IEC 60721-3-3, clause 5	3K3/3B1/3C2/3S1/3M3 * ²¹⁾



- (1) $\cos(\varphi) = +0 \dots 0.8$ (inductive load);
- (2) $\cos(\varphi) = -0.8$ (capacitive load);
- (3) $\cos(\varphi) = -0.2$ (capacitive load);
- (4) $\cos(\varphi) = 1.0$ (ohmic load)

Fig. 14: Two-phase output power as a function of test frequency at rated output voltage (parameter: power factor) for type EPS-2 80-100/0.4

*¹⁹⁾ – at rated output voltage of the EPS; The THD of output voltage is defined in following equation:

$$THD = \frac{\sqrt{\sum_{k=2}^9 (I_k X_k)^2}}{U_1}$$

At a specified fundamental output voltage (U_1), the THD of output voltage depends on the harmonic load current of the converter (I_k) and its output impedances (X_k);

*²⁰⁾ –short-circuit impedance of grid distribution transformer ≤ 4 % / sub-transient impedance of generator ≤ 0.05 Ω;

*²¹⁾ –see Appendix 1.

Type designation: EPS-2 80-200/0.4 (a – output phase number, b – active output power [kW], c – apparent output power [kVA], d – output voltage [kV])

Table 8: Main parameters for EPS-2 80-200/0.4

Rated parameters	
Output power	200 kVA
Output active power	80 kW
Voltage range (r.m.s)	2~ 40 ... 400 V
Rated current (r.m.s)	500 A
Rated frequency	50 / 60 Hz
Output parameters	
Power factor range	0.2 _{cap} ...1...0.2 _{ind}
Frequency range	10...300 Hz
Power limit curve	See Fig. 15
Output impedance: X ₁ , X ₃ , X ₅ , X ₇ , X ₉ at 50 – 150 – 250 - 350 – 450 Hz respectively	2~
	X ₁ 65 mΩ
	X ₃ 190 mΩ
	X ₅ 317 mΩ
	X ₇ 447 mΩ
	X ₉ 581 mΩ
THD of output voltage	<5 % ^{*22)}
Power supply	
Voltage, three-phase	400 V ± 10 %, 50/60 Hz
Power	125 kVA ^{*23)}
Interfaces for control	
Emergency-off & safety loop	
Operation voltage	230 V AC
Contact for warning lamps	
Voltage / Current	230 V AC / max. 5A
Cooling	
Method of cooling	forced-air cooling
Sound pressure level	
	66 dB (A) at 4 m
Dimensions, Environment	
Dimensions (WxHxD)	1000 mm x 2200 mm x 600 mm
Weight	880 kg
Pollution degree acc. to IEC 60664-1, clause 4.5	2 ^{*24)}
Environmental conditions acc. to IEC 60721-3-3, clause 5	3K3/3B1/3C2/3S1/3M3 ^{*24)}

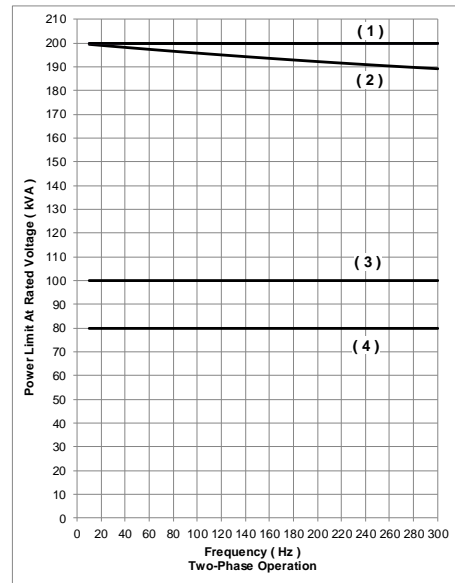
^{*22)} – at rated output voltage of the EPS; The THD of output voltage is defined in following equation:

$$THD = \frac{\sqrt{\sum_{k=2}^9 (I_k X_k)^2}}{U_1}$$

At a specified fundamental output voltage (U_1), the THD of output voltage depends on the harmonic load current of the converter (I_k) and its output impedances (X_k);

^{*23)} –short-circuit impedance of grid distribution transformer ≤ 4 % / sub-transient impedance of generator ≤ 0.05 Ω;

^{*24)} –see Appendix 1.



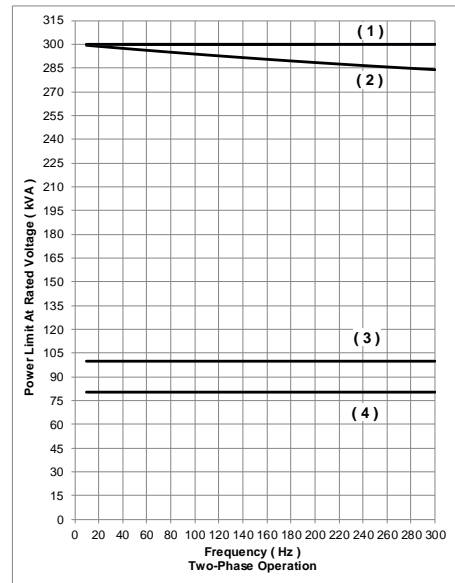
- (1) $\cos(\varphi) = +0 \dots 0.4$ (inductive load);
- (2) $\cos(\varphi) = -0.2$ (capacitive load);
- (3) $\cos(\varphi) = \pm 0.8$ (inductive or capacitive load);
- (4) $\cos(\varphi) = 1.0$ (ohmic load)

Fig. 15: Two-phase output power as a function of test frequency at rated output voltage (parameter: power factor) for type EPS-2 80-200/0.4

Type designation: EPS-2 80-300/0.4 (a – output phase number, b – active output power [kW], c – apparent output power [kVA], d – output voltage [kV])

Table 9: Main parameters for EPS-2 80-300/0.4

Rated parameters	
Output power	300 kVA
Output active power	80 kW
Voltage range (r.m.s)	2~ 40 ... 400 V
Rated current (r.m.s)	750 A
Rated frequency	50 / 60 Hz
Output parameters	
Power factor range	0.2 _{cap} ...1...0.2 _{ind}
Frequency range	10...300 Hz
Power limit curve	See Fig. 16
Output impedance: X ₁ , X ₃ , X ₅ , X ₇ , X ₉ at 50 – 150 – 250 - 350 – 450 Hz respectively	2~
	X ₁ 43 mΩ
	X ₃ 126 mΩ
	X ₅ 211 mΩ
	X ₇ 298 mΩ
X ₉ 387 mΩ	
THD of output voltage	<5 % *25)
Power supply	
Voltage, three-phase	400 V ± 10 %, 50/60 Hz
Power	125 kVA *26)
Interfaces for control	
Emergency-off & safety loop	
Operation voltage	230 V AC
Contact for warning lamps	
Voltage / Current	230 V AC / max. 5A
Cooling	
Method of cooling	forced-air cooling
Sound pressure level	
	66 dB (A) at 4 m
Dimensions, Environment	
Dimensions (WxHxD)	1200 mm x 2200 mm x 600 mm
Weight	1190 kg
Pollution degree acc. to IEC 60664-1, clause 4.5	2 *27)
Environmental conditions acc. to IEC 60721-3-3, clause 5	3K3/3B1/3C2/3S1/3M3 *27)



- (1) $\cos(\varphi) = +0 \dots 0.26$ (inductive load);
- (2) $\cos(\varphi) = -0.2$ (capacitive load);
- (3) $\cos(\varphi) = \pm 0.8$ (inductive or capacitive load);
- (4) $\cos(\varphi) = 1.0$ (ohmic load)

Fig. 16: Two-phase output power as a function of test frequency at rated output voltage (parameter: power factor) for type EPS-2 80-300/0.4

*25) – at rated output voltage of the EPS; The THD of output voltage is defined in following equation:

$$THD = \frac{\sqrt{\sum_{k=2}^9 (I_k X_k)^2}}{U_1}$$

At a specified fundamental output voltage (U_1), the THD of output voltage depends on the harmonic load current of the converter (I_k) and its output impedances (X_k);

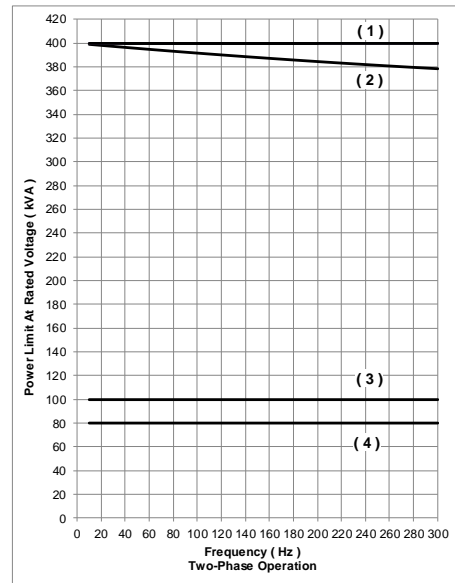
*26) –short-circuit impedance of grid distribution transformer ≤ 4 % / sub-transient impedance of generator ≤ 0.05 Ω;

*27) –see Appendix 1.

Type designation: EPS-2 80-400/0.4 (a – output phase number, b – active output power [kW], c – apparent output power [kVA], d – output voltage [kV])

Table 10: Main parameters for EPS-2 80-400/0.4

Rated parameters	
Output power	400 kVA
Output active power	80 kW
Voltage range (r.m.s)	2~ 40 ... 400 V
Rated current (r.m.s)	1000 A
Rated frequency	50 / 60 Hz
Output parameters	
Power factor range	0.2 _{cap} ...1...0.2 _{ind}
Frequency range	10...300 Hz
Power limit curve	See Fig. 17
Output impedance: X ₁ , X ₃ , X ₅ , X ₇ , X ₉ at 50 – 150 – 250 - 350 – 450 Hz respectively	2~
	x ₁ 32 mΩ
	x ₃ 95 mΩ
	x ₅ 159 mΩ
	x ₇ 224 mΩ
x ₉ 290 mΩ	
THD of output voltage	<5 % *28)
Power supply	
Voltage, three-phase	400 V ± 10 %, 50/60 Hz
Power	125 kVA *29)
Interfaces for control	
Emergency-off & safety loop	
Operation voltage	230 V AC
Contact for warning lamps	
Voltage / Current	230 V AC / max. 5A
Cooling	
Method of cooling	forced-air cooling
Sound pressure level	
	66 dB (A) at 4 m
Dimensions, Environment	
Dimensions (WxHxD)	1600 mm x 2200 mm x 600 mm
Weight	1540 kg
Pollution degree acc. to IEC 60664-1, clause 4.5	2 *30)
Environmental conditions acc. to IEC 60721-3-3, clause 5	3K3/3B1/3C2/3S1/3M3 *30)



- (1) $\cos(\varphi) = +0 \dots 0.2$ (inductive load);
- (2) $\cos(\varphi) = -0.2$ (capacitive load);
- (3) $\cos(\varphi) = \pm 0.8$ (inductive or capacitive load);
- (4) $\cos(\varphi) = 1.0$ (ohmic load)

Fig. 17: Two-phase output power as a function of test frequency at rated output voltage (parameter: power factor) for type EPS-2 80-400/0.4

*28) – at rated output voltage of the EPS; The THD of output voltage is defined in following equation:

$$THD = \frac{\sqrt{\sum_{k=2}^9 (I_k X_k)^2}}{U_1}$$

At a specified fundamental output voltage (U_1), the THD of output voltage depends on the harmonic load current of the converter (I_k) and its output impedances (X_k);

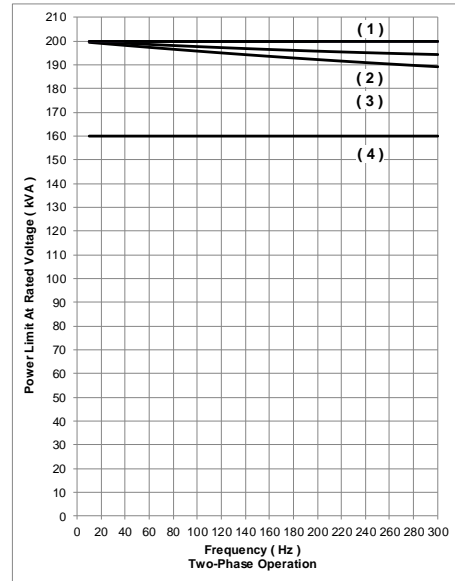
*29) –short-circuit impedance of grid distribution transformer ≤ 4 % / sub-transient impedance of generator ≤ 0.05 Ω;

*30) –see Appendix 1.

Type designation: EPS-2 160-200/0.4 (a – output phase number, b – active output power [kW], c – apparent output power [kVA], d – output voltage [kV])

Table 11: Main parameters for EPS-2 160-200/0.4

Rated parameters	
Output power	200 kVA
Output active power	160 kW
Voltage range (r.m.s)	2~ 40 ... 400 V
Rated current (r.m.s)	500 A
Rated frequency	50 / 60 Hz
Output parameters	
Power factor range	0.2 _{cap} ...1...0.2 _{ind}
Frequency range	10...300 Hz
Power limit curve	See Fig. 18
Output impedance: X ₁ , X ₃ , X ₅ , X ₇ , X ₉ at 50 – 150 – 250 - 350 – 450 Hz respectively	2~
	x ₁ 65 mΩ
	x ₃ 190 mΩ
	x ₅ 317 mΩ
	x ₇ 447 mΩ
x ₉ 581 mΩ	
THD of output voltage	<5 % *31)
Power supply	
Voltage, three-phase	400 V ± 10 %, 50/60 Hz
Power	250 kVA *32)
Interfaces for control	
Emergency-off & safety loop	
Operation voltage	230 V AC
Contact for warning lamps	
Voltage / Current	230 V AC / max. 5A
Cooling	
Method of cooling	forced-air cooling
Sound pressure level	
	66 dB (A) at 4 m
Dimensions, Environment	
Dimensions (WxHxD)	1200 mm x 2200 mm x 600 mm
Weight	1060 kg
Pollution degree acc. to IEC 60664-1, clause 4.5	2 *33)
Environmental conditions acc. to IEC 60721-3-3, clause 5	3K3/3B1/3C2/3S1/3M3 *33)



- (1) $\cos(\varphi) = + 0 \dots 0.8$ (inductive load);
- (2) $\cos(\varphi) = - 0.8$ (capacitive load);
- (3) $\cos(\varphi) = - 0.2$ (capacitive load);
- (4) $\cos(\varphi) = 1.0$ (ohmic load)

Fig. 18: Two-phase output power as a function of test frequency at rated output voltage (parameter: power factor) for type EPS-2 160-200/0.4

*31) – at rated output voltage of the EPS; The THD of output voltage is defined in following equation:

$$THD = \frac{\sqrt{\sum_{k=2}^9 (I_k X_k)^2}}{U_1}$$

At a specified fundamental output voltage (U_1), the THD of output voltage depends on the harmonic load current of the converter (I_k) and its output impedances (X_k);

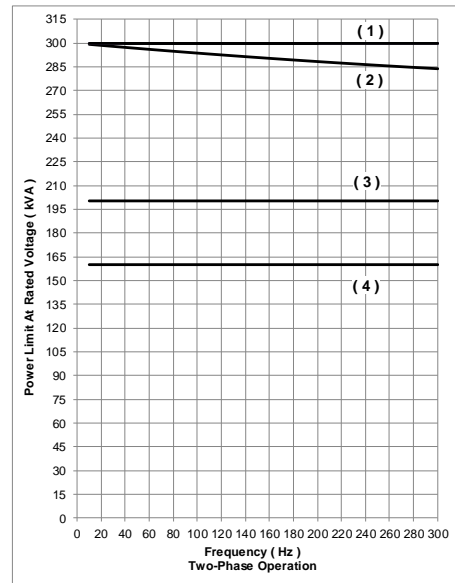
*32) –short-circuit impedance of grid distribution transformer ≤ 4 % / sub-transient impedance of generator ≤ 0.025 Ω;

*33) –see Appendix 1.

Type designation: EPS-2 160-300/0.4 (a – output phase number, b – active output power [kW], c – apparent output power [kVA], d – output voltage [kV])

Table 12: Main parameters for EPS-2 160-300/0.4

Rated parameters	
Output power	300 kVA
Output active power	160 kW
Voltage range (r.m.s)	2~ 40 ... 400 V
Rated current (r.m.s)	750 A
Rated frequency	50 / 60 Hz
Output parameters	
Power factor range	0.2 _{cap} ...1...0.2 _{ind}
Frequency range	10...300 Hz
Power limit curve	See Fig. 19
Output impedance: X ₁ , X ₃ , X ₅ , X ₇ , X ₉ at 50 – 150 – 250 - 350 – 450 Hz respectively	2~
	X ₁ 43 mΩ
	X ₃ 126 mΩ
	X ₅ 211 mΩ
	X ₇ 298 mΩ
X ₉ 387 mΩ	
THD of output voltage	<5 % ^{*34)}
Power supply	
Voltage, three-phase	400 V ± 10 %, 50/60 Hz
Power	250 kVA ^{*35)}
Interfaces for control	
Emergency-off & safety loop	
Operation voltage	230 V AC
Contact for warning lamps	
Voltage / Current	230 V AC / max. 5A
Cooling	
Method of cooling	forced-air cooling
Sound pressure level	
	66 dB (A) at 4 m
Dimensions, Environment	
Dimensions (WxHxD)	1600 mm x 2200 mm x 600 mm
Weight	1410 kg
Pollution degree acc. to IEC 60664-1, clause 4.5	2 ^{*36)}
Environmental conditions acc. to IEC 60721-3-3, clause 5	3K3/3B1/3C2/3S1/3M3 ^{*36)}



- (1) $\cos(\varphi) = + 0 \dots 0.53$ (inductive load);
- (2) $\cos(\varphi) = - 0.2$ (capacitive load);
- (3) $\cos(\varphi) = \pm 0.8$ (inductive or capacitive load);
- (4) $\cos(\varphi) = 1.0$ (ohmic load)

Fig. 19: Two-phase output power as a function of test frequency at rated output voltage (parameter: power factor) for type EPS-2 160-300/0.4

^{*34)} – at rated output voltage of the EPS; The THD of output voltage is defined in following equation:

$$THD = \frac{\sqrt{\sum_{k=2}^9 (I_k X_k)^2}}{U_1}$$

At a specified fundamental output voltage (U_1), the THD of output voltage depends on the harmonic load current of the converter (I_k) and its output impedances (X_k);

^{*35)} –short-circuit impedance of grid distribution transformer ≤ 4 % / sub-transient impedance of generator ≤ 0.025 Ω;

^{*36)} –see Appendix 1.

Type designation: EPS-2 160-400/0.4 (a – output phase number, b – active output power [kW], c – apparent output power [kVA], d – output voltage [kV])

Table 13: Main parameters for EPS-2 160-400/0.4

Rated parameters	
Output power	400 kVA
Output active power	160 kW
Voltage range (r.m.s)	2~ 40 ... 400 V
Rated current (r.m.s)	1000 A
Rated frequency	50 / 60 Hz
Output parameters	
Power factor range	0.2 _{cap} ...1...0.2 _{ind}
Frequency range	10...300 Hz
Power limit curve	See Fig. 20
Output impedance: X ₁ , X ₃ , X ₅ , X ₇ , X ₉ at 50 – 150 – 250 - 350 – 450 Hz respectively	2~
	x ₁ 32 mΩ
	x ₃ 95 mΩ
	x ₅ 159 mΩ
	x ₇ 224 mΩ
x ₉ 290 mΩ	
THD of output voltage	<5 % ^{*37)}
Power supply	
Voltage, three-phase	400 V ± 10 %, 50/60 Hz
Power	250 kVA ^{*38)}
Interfaces for control	
Emergency-off & safety loop	
Operation voltage	230 V AC
Contact for warning lamps	
Voltage / Current	230 V AC / max. 5A
Cooling	
Method of cooling	forced-air cooling
Sound pressure level	
	66 dB (A) at 4 m
Dimensions, Environment	
Dimensions (WxHxD)	2000 mm x 2200 mm x 600 mm
Weight	1770 kg
Pollution degree acc. to IEC 60664-1, clause 4.5	2 ^{*39)}
Environmental conditions acc. to IEC 60721-3-3, clause 5	3K3/3B1/3C2/3S1/3M3 ^{*39)}

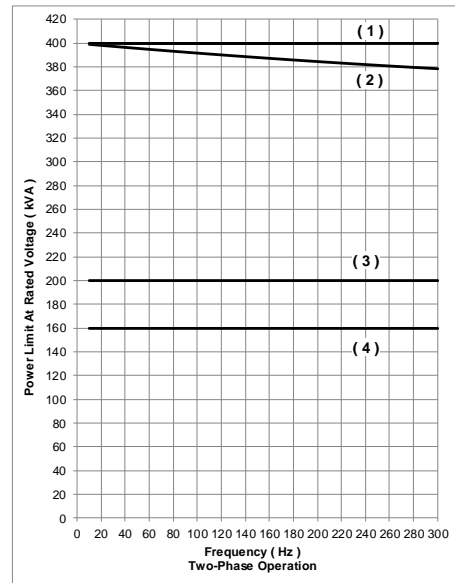
^{*37)} – at rated output voltage of the EPS; The THD of output voltage is defined in following equation:

$$THD = \frac{\sqrt{\sum_{k=2}^9 (I_k X_k)^2}}{U_1}$$

At a specified fundamental output voltage (U_1), the THD of output voltage depends on the harmonic load current of the converter (I_k) and its output impedances (X_k);

^{*38)} –short-circuit impedance of grid distribution transformer ≤ 4 % / sub-transient impedance of generator ≤ 0.025 Ω;

^{*39)} –see Appendix 1.



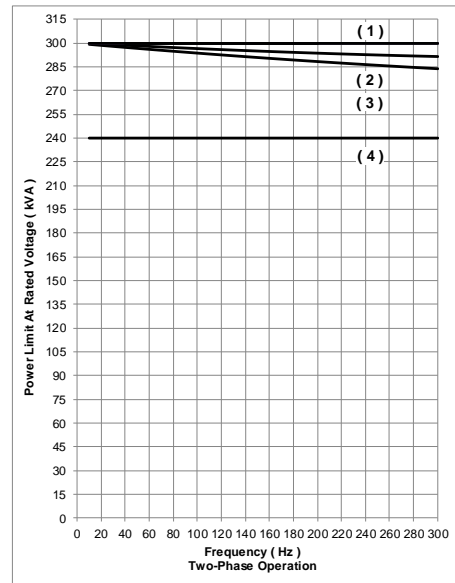
- (1) $\cos(\varphi) = +0 \dots 0.4$ (inductive load);
- (2) $\cos(\varphi) = -0.2$ (capacitive load);
- (3) $\cos(\varphi) = \pm 0.8$ (inductive or capacitive load);
- (4) $\cos(\varphi) = 1.0$ (ohmic load)

Fig. 20: Two-phase output power as a function of test frequency at rated output voltage (parameter: power factor) for type EPS-2 160-400/0.4

Type designation: EPS-2 240-300/0.4 (a – output phase number, b – active output power [kW], c – apparent output power [kVA], d – output voltage [kV])

Table 14: Main parameters for EPS-2 240-300/0.4

Rated parameters	
Output power	300 kVA
Output active power	240 kW
Voltage range (r.m.s)	2~ 40 ... 400 V
Rated current (r.m.s)	750 A
Rated frequency	50 / 60 Hz
Output parameters	
Power factor range	0.2 _{cap} ...1...0.2 _{ind}
Frequency range	10...300 Hz
Power limit curve	See Fig. 21
Output impedance: X ₁ , X ₃ , X ₅ , X ₇ , X ₉ at 50 – 150 – 250 - 350 – 450 Hz respectively	2~
	X ₁ 43 mΩ
	X ₃ 126 mΩ
	X ₅ 211 mΩ
	X ₇ 298 mΩ
X ₉ 387 mΩ	
THD of output voltage	<5 % ^{*40)}
Power supply	
Voltage, three-phase	400 V ± 10 %, 50/60 Hz
Power	315 kVA ^{*41)}
Interfaces for control	
Emergency-off & safety loop	
Operation voltage	230 V AC
Contact for warning lamps	
Voltage / Current	230 V AC / max. 5A
Cooling	
Method of cooling	forced-air cooling
Sound pressure level	
	66 dB (A) at 4 m
Dimensions, Environment	
Dimensions (WxHxD)	1800 mm x 2200 mm x 600 mm
Weight	1590 kg
Pollution degree acc. to IEC 60664-1, clause 4.5	2 ^{*42)}
Environmental conditions acc. to IEC 60721-3-3, clause 5	3K3/3B1/3C2/3S1/3M3 ^{*42)}



- (1) $\cos(\varphi) = + 0 \dots 0.8$ (inductive load);
- (2) $\cos(\varphi) = - 0.8$ (capacitive load);
- (3) $\cos(\varphi) = - 0.2$ (capacitive load);
- (4) $\cos(\varphi) = 1.0$ (ohmic load)

Fig. 21: Two-phase output power as a function of test frequency at rated output voltage (parameter: power factor) for type EPS-2 240-300/0.4

^{*40)} – at rated output voltage of the EPS; The THD of output voltage is defined in following equation:

$$THD = \frac{\sqrt{\sum_{k=2}^9 (I_k X_k)^2}}{U_1}$$

At a specified fundamental output voltage (U_1), the THD of output voltage depends on the harmonic load current of the converter (I_k) and its output impedances (X_k);

^{*41)} –short-circuit impedance of grid distribution transformer ≤ 4 % / sub-transient impedance of generator ≤ 0.02 Ω;

^{*42)} –see Appendix 1.

Type designation: EPS-2 240-400/0.4 (a – output phase number, b – active output power [kW], c – apparent output power [kVA], d – output voltage [kV])

Table 15: Main parameters for EPS-2 240-400/0.4

Rated parameters	
Output power	400 kVA
Output active power	240 kW
Voltage range (r.m.s)	2~ 40 ... 400 V
Rated current (r.m.s)	1000 A
Rated frequency	50 / 60 Hz
Output parameters	
Power factor range	0.2 _{cap} ...1...0.2 _{ind}
Frequency range	10...300 Hz
Power limit curve	See Fig. 22
Output impedance: X ₁ , X ₃ , X ₅ , X ₇ , X ₉ at 50 – 150 – 250 - 350 – 450 Hz respectively	2~
	x ₁ 32 mΩ
	x ₃ 95 mΩ
	x ₅ 159 mΩ
	x ₇ 224 mΩ
x ₉ 290 mΩ	
THD of output voltage	<5 % *43)
Power supply	
Voltage, three-phase	400 V ± 10 %, 50/60 Hz
Power	315 kVA *44)
Interfaces for control	
Emergency-off & safety loop	
Operation voltage	230 V AC
Contact for warning lamps	
Voltage / Current	230 V AC / max. 5A
Cooling	
Method of cooling	forced-air cooling
Sound pressure level	
	66 dB (A) at 4 m
Dimensions, Environment	
Dimensions (WxHxD)	2200 mm x 2200 mm x 600 mm
Weight	1940 kg
Pollution degree acc. to IEC 60664-1, clause 4.5	2 *45)
Environmental conditions acc. to IEC 60721-3-3, clause 5	3K3/3B1/3C2/3S1/3M3 *45)

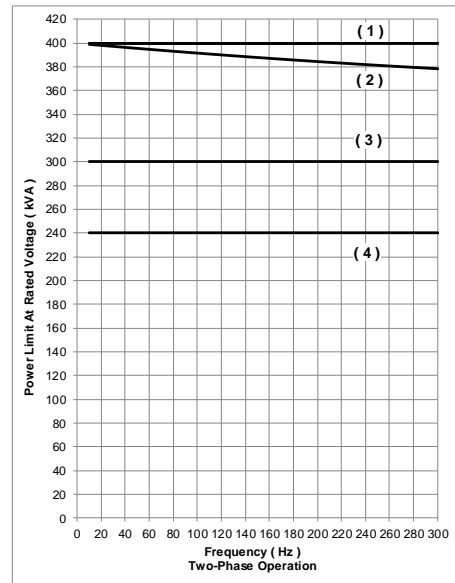
*43) – at rated output voltage of the EPS; The THD of output voltage is defined in following equation:

$$THD = \frac{\sqrt{\sum_{k=2}^9 (I_k X_k)^2}}{U_1}$$

At a specified fundamental output voltage (U_1), the THD of output voltage depends on the harmonic load current of the converter (I_k) and its output impedances (X_k);

*44) –short-circuit impedance of grid distribution transformer ≤ 4 % / sub-transient impedance of generator ≤ 0.02 Ω;

*45) –see Appendix 1.



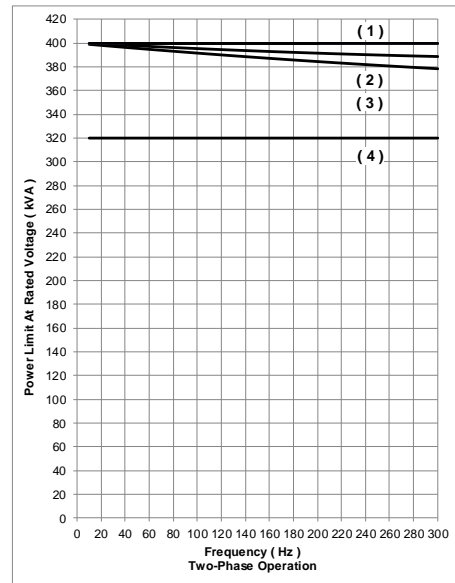
- (1) $\cos(\varphi) = +0 \dots 0.6$ (inductive load);
- (2) $\cos(\varphi) = -0.2$ (capacitive load);
- (3) $\cos(\varphi) = \pm 0.8$ (inductive or capacitive load);
- (4) $\cos(\varphi) = 1.0$ (ohmic load)

Fig. 22: Two-phase output power as a function of test frequency at rated output voltage (parameter: power factor) for type EPS-2 240-400/0.4

Type designation: EPS-2 320-400/0.4 (a – output phase number, b – active output power [kW], c – apparent output power [kVA], d – output voltage [kV])

Table 16: Main parameters for EPS-2 320-400/0.4

Rated parameters	
Output power	400 kVA
Output active power	320 kW
Voltage range (r.m.s)	2~ 40 ... 400 V
Rated current (r.m.s)	1000 A
Rated frequency	50 / 60 Hz
Output parameters	
Power factor range	0.2 _{cap} ...1...0.2 _{ind}
Frequency range	10...300 Hz
Power limit curve	See Fig. 23
Output impedance: X ₁ , X ₃ , X ₅ , X ₇ , X ₉ at 50 – 150 – 250 - 350 – 450 Hz respectively	2~
	x ₁ 32 mΩ
	x ₃ 95 mΩ
	x ₅ 159 mΩ
	x ₇ 224 mΩ
x ₉ 290 mΩ	
THD of output voltage	<5 % ^{*46)}
Power supply	
Voltage, three-phase	400 V ± 10 %, 50/60 Hz
Power	400 kVA ^{*47)}
Interfaces for control	
Emergency-off & safety loop	
Operation voltage	230 V AC
Contact for warning lamps	
Voltage / Current	230 V AC / max. 5A
Cooling	
Method of cooling	forced-air cooling
Sound pressure level	
	66 dB (A) at 4 m
Dimensions, Environment	
Dimensions (WxHxD)	2400 mm x 2200 mm x 600 mm
Weight	2120 kg
Pollution degree acc. to IEC 60664-1, clause 4.5	2 ^{*48)}
Environmental conditions acc. to IEC 60721-3-3, clause 5	3K3/3B1/3C2/3S1/3M3 ^{*48)}



- (1) $\cos(\varphi) = + 0 \dots 0.8$ (inductive load);
- (5) $\cos(\varphi) = - 0.8$ (capacitive load);
- (6) $\cos(\varphi) = - 0.2$ (capacitive load);
- (7) $\cos(\varphi) = 1.0$ (ohmic load)

Fig. 23: Two-phase output power as a function of test frequency at rated output voltage (parameter: power factor) for type EPS-2 320-400/0.4

^{*46)} – at rated output voltage of the EPS; The THD of output voltage is defined in following equation:

$$THD = \frac{\sqrt{\sum_{k=2}^9 (I_k X_k)^2}}{U_1}$$

At a specified fundamental output voltage (U_1), the THD of output voltage depends on the harmonic load current of the converter (I_k) and its output impedances (X_k);

^{*47)} –short-circuit impedance of grid distribution transformer ≤ 4 % / sub-transient impedance of generator ≤ 0.016 Ω;

^{*48)} –see Appendix 1.

Type designation: EPS-2 400-400/0.4 (a – output phase number, b – active output power [kW], c – apparent output power [kVA], d – output voltage [kV])

Table 17: Main parameters for EPS-2 400-400/0.4

Rated parameters	
Output power	400 kVA
Output active power	400 kW
Voltage range (r.m.s)	2~ 40 ... 400 V
Rated current (r.m.s)	1000 A
Rated frequency	50 / 60 Hz
Output parameters	
Power factor range	0.2 _{cap} ...1...0.2 _{ind}
Frequency range	10...300 Hz
Power limit curve	See Fig. 24
Output impedance: X ₁ , X ₃ , X ₅ , X ₇ , X ₉ at 50 – 150 – 250 - 350 – 450 Hz respectively	2~
	X ₁ 32 mΩ
	X ₃ 95 mΩ
	X ₅ 159 mΩ
	X ₇ 224 mΩ
X ₉ 290 mΩ	
THD of output voltage	<5 % ^{*49)}
Power supply	
Voltage, three-phase	400 V ± 10 %, 50/60 Hz
Power	500 kVA ^{*50)}
Interfaces for control	
Emergency-off & safety loop	
Operation voltage	230 V AC
Contact for warning lamps	
Voltage / Current	230 V AC / max. 5A
Cooling	
Method of cooling	forced-air cooling
Sound pressure level	
	66 dB (A) at 4 m
Dimensions, Environment	
Dimensions (WxHxD)	2400 mm x 2200 mm x 600 mm
Weight	2240 kg
Pollution degree acc. to IEC 60664-1, clause 4.5	2 ^{*51)}
Environmental conditions acc. to IEC 60721-3-3, clause 5	3K3/3B1/3C2/3S1/3M3 ^{*51)}

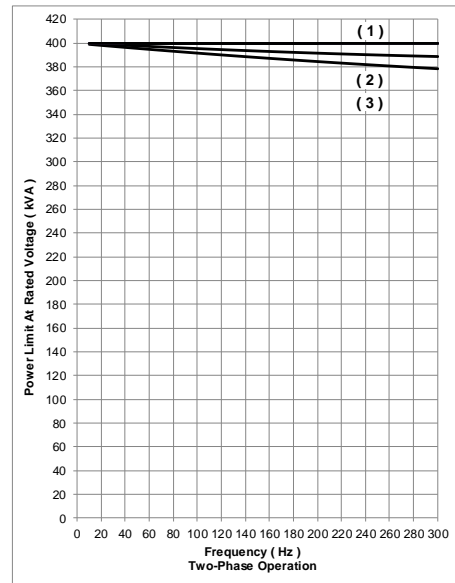
^{*49)} – at rated output voltage of the EPS; The THD of output voltage is defined in following equation:

$$THD = \frac{\sqrt{\sum_{k=2}^9 (I_k X_k)^2}}{U_1}$$

At a specified fundamental output voltage (U_1), the THD of output voltage depends on the harmonic load current of the converter (I_k) and its output impedances (X_k);

^{*50)} –short-circuit impedance of grid distribution transformer ≤ 4 % / sub-transient impedance of generator ≤ 0.013 Ω;

^{*51)} –see Appendix 1.



- (1) $\cos(\varphi) = +0 \dots 1$ (ohmic and inductive load);
- (2) $\cos(\varphi) = -0.8$ (capacitive load);
- (3) $\cos(\varphi) = -0.2$ (capacitive load);

Fig. 24: Two-phase output power as a function of test frequency at rated output voltage (parameter: power factor) for type EPS-2 400-400/0.4

Appendix 1: Detailed information on pollution degree and environmental conditions

1.1 Degrees of pollution in the micro-environment

According to the IEC 60664-1, clause 4.5, the following four degrees of pollution in the micro-environment are established:

- Pollution degree 1
No pollution or only dry, non-conductive pollution occurs. The pollution has no influence.
- Pollution degree 2
Only non-conductive pollution occurs except that occasionally a temporary conductivity caused by condensation is to be expected. This condensation may occur during periods of on-off load cycles of the equipment.
- Pollution degree 3
Conductive pollution occurs or dry non-conductive pollution occurs which becomes conductive due to condensation which is to be expected.
- Pollution degree 4
Continuous conductivity occurs due to conductive dust, rain or other wet conditions.

The ambient air pollution of the Electronic Power Source (EPS) must comply with the pollution degree 2.

1.2 Environmental conditions

According to the IEC 60721-3-3, clause 5, the operational environmental parameters of the class combinations "3K3/3B1/3C2/3S1/3M3" are shown in the following table.

Table 18: Operational environmental parameters

Group of environmental conditions	Class	Environmental parameters		
Climatic conditions	3K3	Temperature range	+5 ... + 40°C	
		Relative humidity range	5% ... 85%	
		Condensation	no	
		Altitude over sea level	0... 2000 m	
Biological conditions	3B1	Flora	no	
		Fauna	no	
Chemically active substances	3C2	Sulphur dioxide	0.3 ... 1.0 mg/m ³	
		Hydrogen sulphide	0.1 ... 0.5 mg/m ³	
		Chlorine	0.1 ... 0.3 mg/m ³	
		Hydrogen chloride	0.1 ... 0.5 mg/m ³	
		Hydrogen fluoride	0.01 ... 0.03 mg/m ³	
		Ammonia	1.0 ... 3.0 mg/m ³	
		Ozone	0.05 ... 0.1 mg/m ³	
Mechanically active substances	3S1	Sand	no	
		Dust (suspension)	0.01 mg/m ³	
		Dust (sedimentation)	0.4 mg/(m ² .h)	
Mechanical conditions	3M3	Stationary vibration sinusoidal	Displacement amplitude in frequency range of 2 ... 9 Hz	1.5 mm
			Acceleration amplitude in frequency range of 9...200 Hz	5 m/s ²
		Non-stationary vibration acc. Shock response spectrum type L	70 m/s ³	