1-Axis MRI Gradient Amplifier

GPA-400-750

International Electric Co.
Output performance

Output current max ±400 A
Pulse duration max 25ms @ 400A, duty cycle 25% max 1)  
100ms@ 300A, duty cycle 45% max 1)  
Output current rms 200 A bipolar 1)  
Output current dc 150 A 1)  
Output voltage max ±750 V  
Rise time to 120uH coil < 60 us, 0-200 A (10-90 %)  
< 80 us, 0-300 A (10-90 %)  
< 100 us, 0-400 A (10-90 %)  
Switching frequency > 180 kHz effective  
Switching frequency ripple < 3 Vrms differential  
Bandwidth > 10 kHz (-3dB)  
Propagation delay 20-25 us, independent on amplitude 2)  
Output noise current:  
0,1...10Hz < 500...200 μArms linearly descending  
10...10kHz < 200 μArms  
DC-offset current < 10 mA, including self heating and ambient temperature effects, adjustable to zero  
Gain accuracy and linearity < 0.05 %, total gain error including self heating and ambient temperature effects  
Total Harmonic Distortion < 0.25 % @ 1kHz, 200 Arms

1) Load dependent. Test load 580 uH + 120mΩ. Bipolar pulse.  
2) Additional constant 20us delay when using signal low-pass filtering

Control and monitoring

Input sensitivity 1/40 V/A Factory set, user definable  
Signal input impedance 30 kΩ  
Current monitor 1/40 V/A BNC-connector at cover of amplifier unit  
Voltage monitor 1/100 V/V BNC-connector at cover of amplifier unit

Fault protection:  
(Shutdown due to) Overcurrent  
Overvoltage  
Overheat  
Overload  
Low DC voltage  
Internal voltages out of tolerance  
IGBT failure  
Software failure

Tuning to load (supported 15 different coils for each axis) and diagnostics are done with GPA Tuner program. Communication port mini-USB.
System specifications

Input voltage 3-phase 400/480 Vph-ph, 50/60 Hz
Input current 32 Arms @ 400 V
27 Arms @ 480 V

Power supply:
Output voltage 410 Vdc, effective 820 Vdc
Output power continuous 20 kW
Output power pulsed > 100 kW
Capacitor bank > 40 mF
Power factor >0.9 , active PFC input stage

Environmental requirements:
Ambient temperature 10 °C to 30 °C
Ambient humidity 30 to 70 % non-condensing
Storage temperature -20 °C to +85 °C
Cooling Air cooling (front in, rear out)

Cabinet dimensions:
Height 1200 mm
Width 600 mm
Depth 900 mm
Weight 390 kg

Regulatory

Safety and Compliance CB certificate EN 61010, EN 60601-1

1-Axis MRI
Gradient Amplifier
400A 750V

Amplifier output current and voltage waveforms to 580 μH gradient coil
Company in brief

International Electric Company (IECO) designs and manufactures state-of-the-art electronics for medical, industrial and military applications tailored to meet customer needs.

With over 30 years of experience in power electronics we are able to provide solutions for even the most challenging requirements. IECO's quality system is ISO 9001 and ISO 13485 certified.

Power amplifier technology

IECO introduced its first gradient amplifier in 1994. This revolutionary PWM amplifier enabled excellent image quality in open MRI systems. Simultaneously IECO also launched the first D-class magnet power supply delivering new efficiency levels with 0.1ppm accuracy. IECO's expertise has recently been utilized in the development of the industry's first High Temperature Superconductive MRI magnets.

IECO's power amplifiers are easily scalable for any type of load and any power level needed. Compact amplifier units can be connected in series or in parallel in Master/Slave operation to gain output voltages up to 1100V and output currents up to 1200A. Thanks to low-noise, wide bandwidth and excellent step response, IECO has gained the reputation of a technology leader in gradient amplifiers.

Over 700 MRI amplifier systems delivered worldwide.

International Electric Co. Oy
Sahaajankatu 48
00880 Helsinki, Finland
Tel. +358 (0)9 759 4470
Fax +358 (0)9 759 447 57
Email: info@ieco.fi
Internet: www.ieco.fi