Three-phase, dual-system power source for electricity meters calibration

DESCRIPTION

Electronic AC sources have several inherent advantages over rotating. One of the essential, if we exclude the possibility of producing portable implementation of the source, is the adjustment of operating parameters (voltage, current, phase angle, added harmonic components). Developed three-phase source is by design a dual-system (U-source, I-source), which was designed for calibrating electricity meters for the principal AMESI Iskra, Kranj. The focus of research has been concentrated on the implementation of the output amplifier stages and the digital correction procedure of eliminating their nonlinearity, with the aim of achieving the minimization of the harmonic distortion factor (THD <0.1%).

Fig: Stationary and portable version of three phase power source

TABLE I
COMMON SPECIFICATIONS OF POWER SOURCE

Output specification	Power source version	
	Stationary	Portable
Voltage (phase to neutral)	30 V to 480 V	30 V to 480 V
Setting step$_U$	0.01 V	0.01 V
Power$_U$	up to 2 kVA	60 VA
THD$_U$	< 0.2%	< 0.1%
Current	1mA to 200 A	1mA to 60 A
Setting step$_I$	0.01 mA (up to 1 A); 0.01 A (over 1 A)	0.01 mA (up to A); 0.01 A (over 1 A)
Power$_I$	up to 8 kVA	60 VA
THD$_I$	< 0.2%	< 0.1%
Setting accuracy	< 0.1%	< 0.05%
Time stability	< 0.01 %/h	< 0.01 %/h
Frequency	45 Hz to 65 Hz	45 Hz to 65 Hz
Freq. accuracy	± 0.01 Hz	± 0.01 Hz
Phase angle	0° to 359.99°	0° to 359.99°
Phase angle accuracy	< ± 0.1°	< ± 0.1°
Harmonics generation	up to 20th	up to 30th

KEY ADVANTAGES/SKILLS

PWM and TDM modulation, DC premagnetization detection, repetitive controller

PUBLICATIONS

1. Peter Zajec, Janez Nastran, **Power calibrator using switched mode voltage source**, IEEE trans. instrum. meas., vol. 49, no. 4, pp. 790-794, 2000.
2. Henrik Lavrič, Danijel Vončina, Peter Zajec, France Pavlovčič, Janez Nastran, **A precision hybrid amplifier for voltage calibration systems**, Inf. MIDEM, letn. 34, št. 1, pp. 37-42, 2004.
3. Gorazd Modrijan, Peter Zajec, Janez Nastran, Henrik Lavrič, Danijel Vončina, **A three-phase power source with low THD for energy meters calibration**, EPE-PEMC 2006, pp. 895-900.

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