EPG7 – Voltage and Current Generator

- operating parameters setting of the generator in remote control mode, setting of primary and secondary values conversion, generating of V and I,
- user parameters settings of device,
- work with fault records,
- formats REC and COMTRADE,
- records player,
- records storage in device,
- uploading of records from device,
- uploading of license numbers,
- FW updates,
- support of all EPG7 functions, tests of protective functions and automatics.

General Description

The EPG7 is a compact generator of AC or DC three-phase currents in values up to the tens of mA primarily designed for testing of the correct functions of the measurements and protections of RTU units or other devices, where are the parameters of EPG7 suitable. The device can also be used as a simple process calibrator – the output current corresponds within the declared accuracy to the value shown on the display.

When fitted with a voltage card, the device can generate three-phase AC or DC voltage up to units of volts. There are 4 digital inputs and 4 digital outputs which can be used in advanced functions for testing of the protections.

All versions of the device are fitted with a 4-line LCD display with a rotary knob with an integrated control button. A USB interface is used for communication with the user SW. The analogue outputs, digital outputs, digital inputs and USB interface are galvanically isolated.

The device can be powered by 4 x AA NiMh batteries or from an external adapter. When powered from batteries, the operating time is approximately 2 hours (permanent generation of 45 mA AC currents on all outputs). The discharging of batteries is indicated by the LED diode. The internal fast charger has LED signaling of the charging process.

EPG7 Ways of Using

- currents generation, eventually voltage, AC / DC,
- P, Q generation,
- phase to phase voltage setup,
- independent amplitude, frequency, phase setup for individual outputs,
- playing of records from protections (proprietary format REC from ELVAC RTU, COMTRADE),
- simulator of status of power element, including the interposition,
- optional control and reading of DI/DO,
- protection tests – current, earth, voltage, frequency,
- tests of fault currents indicators,
- test of reclosing,
- test of disconnecting in voltage-free pause,
- multichannel process calibrator.

EPG7

Basic Features

- three-channel currents generator in range 0 ÷ 45 mA AC and 0 ÷ ±60 mA DC,
- in extended version three-channel voltage generator 0 ÷ 7 V AC and 0 ÷ ±10 V DC,
- analog output protection against overloading with indication,
- 4 × DI and in extended version 4 × DO for tests of protection relay functions,
- alphanumeric LCD display and rotary knob with integrated button for easy control,
- powering from NiMH batteries or external adapter,
- integrated fast battery charger,
- USB 2.0 interface with galvanic isolation,
- wide range of user FW,
- optional user upgrade of FW according to demanded functionality,
- upper versions of FW can generate fault waveforms obtained from protections (format COMTRADE, proprietary format REC of ELVAC RTU),
- optional storage of generated waveforms in internal memory,
- another functions for tests of protective functions are in specialized FW,
- operating SW is available for PC.

Available HW Variants of EPG7

Equipment according to variant	Basic	Advanced
Current AC/DC outputs	3	3
Voltage AC/DC outputs	–	3
Digital inputs	4	4
Digital outputs	–	4
Batteries	–	4 × NiMH AA
Power adapter	–	230 V AC / 9 V DC
Type of FW	Basic	Basic + Voltage generator

Note: *FW versions, which are not mentioned in equipment of given version, are extra cost.*

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Description of Available FW for EPG7

FW-EPG7-A

This version of Firmware can be used for generating of AC or DC current with Basic HW version of EPG7 and also for voltage generating with Advanced version of EPG7. This FW is free of charge.

Fixed frequency 50Hz and phase shift 120° are set for AC waveforms. The user only changes the amplitude of the generated signal – the same in all three phases. There is the option to read DI in Basic version and the option to read DI and control DO is available in Advanced version.

FW-EPG7-B

This version of firmware is licensed and has to be activated via SW EPGAP in EPG7. It is available only for Advanced version of EPG7 and can be purchased for expansion with the following functions:

Function Generator – it enables to set independent amplitudes, frequencies and phase shifts on individual voltage and current outputs.

Record Player – option to play fault records from protections (formats COMTRADE, proprietary REC) – requires SW on PC.

IPP Tester – automatic testing of the indicators of fault currents.

Protection Relay Tester – automatic testing of protective functions in RTU units and other similar devices.

EPG7

User SW for EPG7

For maximal user comfort of EPG7, the software **EPGAP** for PC (OS MS Windows) can be used. Available functions correspond to equipment and firmware type in EPG7.

Besides the comfortable control of all parameters (amplitude, frequency, phase, etc.), it is possible to download fault records from ELVAC RTU units in the REC format, or from any protection relays in the standard format COMTRADE, upload them into the generator memory and then to generate on its output. There is also the option to create own waveforms for specific testing purposes. There can be read from the generator an error states (diagnostics, checking of generated values is available) and timestamps of changes on digital inputs (DI data logger). The user interface also enables to set the digital outputs, eventually the parameters of the routines for automatic testing of the RTU units (including simulation of the response of the power element).

Bi-directional communication between the PC and the generator is ensured through an USB communication interface.

SW EPGAP

Summary of SW EPGAP Functions

- operating parameters setting of the generator in remote control mode, setting of primary and secondary values conversion, generating of V and I,
- user parameters settings of device,
- work with fault records,
- formats REC and COMTRADE,
- records player,
- records storage in device,
- uploading of records from device,
- uploading of license numbers,
- FW updates,
- support of all EPG7 functions, tests of protective functions and automatics.

Technical Specification of EPG7 (According to the Equipment of Particular Type)

Basic Specification		
Display	LCD 16×4	
Control	Rotary knob with integrated button	
Power supply voltage	9 V DC	
Input protection	Polyswitch 2.5 A	
Backup battery	4 × NiMH AA, capacity 2100 mAh max.	
Charging current of battery	1.5 A	
Battery protection	Polyswitch 2.5 A	
Dimensions	196 (207) × 100 × 40 mm	
Weight	1 kg	
Operating temperature	0 °C ÷ +50 °C	
Storage temperature	-20 °C ÷ +75 °C	
Ambient relative humidity	5% ÷ 95 % non-condensing	
Ingress protection	IP20	
Current Outputs		
Number	3	
Generated currents ranges	45 mA AC / ±60 mA DC	
Accuracy of generated currents	±0.1 % from range	
Load impedance	Max. 100 Ω @ 45 mA AC	
Frequency of generated current	40 ÷ 350 Hz	
Individual outputs phase shift setup	0 ÷ 360 °	
Protection against current loop disconnection	Yes, indication of exceeding of maximal load impedance – LED AOF	
Signal processing	16-bit D/A converter	
Connectors	2 × WAGO 734-102; spacing 3.5 mm; part of delivery	
Wire cross-section	0.08 ÷ 1.5 mm^2	
Voltage Outputs		
Number	3	
Generated voltages ranges	7 V AC / ±10 V DC	
Accuracy of generated voltages	±0.1 % from range	
Output current	Max. 30 mA AC	
Frequency of generated voltage	40 ÷ 350 Hz	
Individual outputs phase shift setup	0 ÷ 360 °	
Overload protection	Yes, indication of low load impedance connection – LED AOF	
Signal processing	16-bit D/A converter	
Connectors	2 × WAGO 734-102; spacing 3.5 mm; part of delivery	
Wire cross-section	0.08 ÷ 1.5 mm^2	
Digital Inputs		
Number	4 digital inputs	
Signaling voltage	12 V / 24 V	
Inputs configuration	Active (dry contact)	Passive (switching by external voltage, both polarities)
Level H	Close	11 ÷ 40 V
Level L	Open	0 ÷ 8 V
Input current	6.6 mA max.	2 ÷ 6.6 mA; 3.3 mA @ 12 V
Isolation voltage	1.5 kV DC for 1 minute	
Connectors	2 × WAGO 734-108; spacing 3.5 mm; part of delivery	
Wire cross-section	0.08 ÷ 1.5 mm^2	
Digital Outputs		
Number	4 digital outputs	
Isolation voltage	3750 Vrms for 1 minute	
Switch loadability	1.75 A @ 35 V AC; 2.5 A @ 50 V DC	
Resistance in close status	0.1 Ω max.	
Connectors	1 × WAGO 734-108; spacing 3.5 mm; part of delivery	
Wire cross-section	0.08 ÷ 1.5 mm^2	
Communication Interface		
Type	USB 2.0	
Connector	Mini USB B, 5 pins	
Isolation	4 kV for 1 minute	

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EPG7 HP – Power Outputs Extension

Basic Features

- extension of generator EPG7 by power outputs,
- designed for testing the correct function of protection and measurements in the standard ranges (100 V, 1 or 5 A),
- communication between the generator and the power module, transmission of ranges, calibration and error messages,
- easy transport in case with wheels, the device can be removed and placed on a table,
- optional external battery pack, converter for powering from 12 / 24 V.

EPG7 HP

Technical Specification

Current outputs	3 × max. 20 A AC
Voltage outputs	3 × max. 300 V AC
Amplitude control	0 ÷ 100 % (signal from EPG7)
Frequency	40 ÷ 350 Hz (signal from EPG7)
Angle between phases	0 ÷ 360 ° (signal from EPG7)
Digital inputs	3 × optocoupler (from EPG7)
Digital outputs	3 × SSR (from EPG7)
Control and signaling	through EPG7
Communication	Connected with EPG7 through 1 × DI/DO
Powering	230 V AC, 50 Hz optional converter from 12 / 24 V optional battery pack
Dimensions	600 × 490 × 300 mm (case)
Weight	32 kg (with case)

EPG7 OC

General Description

The module EPG7 OC is output converter from current outputs to voltage outputs. As there are available on the market the low power current sensors with voltage outputs (for ex. 225 mV), the generator EPG7 can simulate these sensors on its current outputs via this converter.

The module EPG7 OC can be directly inserted into current outputs connector in handheld generator EPG7.

EPG7 OC

Technical Specification

Module	EPG7 OC-45/2.25/50
Current inputs	3 × 0 ÷ 45 mA AC
Voltage outputs	3 × 0 ÷ 2.25 V AC