

**Three-phase Programmable
Waveform Generator**

Energoforma 3.3

EQUIPMENT CERTIFICATE

Edition 12

MC2.211.001 EC

CONTENTS

INTRODUCTION	3
1. SAFETY REQUIREMENTS	4
2. DESCRIPTION	5
2.1. APPLICATION	5
2.2. OPERATING CONDITIONS	5
2.3. DELIVERY PACKAGE	5
2.4. SPECIFICATIONS.....	6
3. USER MAINTENANCE	9
4. STORAGE	10
5. TRANSPORTATION	11
6. MARKING AND SEALING	12
7. WARRANTY	13
8. PACKING FORM	15
9. ACCEPTANCE FORM	15
10. WARRANTY CLAIM	16

Introduction

This Equipment Certificate (hereinafter referred to as EC) covers Programmable Waveform Generator Energoforma 3.3 (hereinafter referred to as the Generator) and includes the information about its operation, maintenance, transportation and storage. The document also represents the appropriate acceptance and packing forms and contains the information about warranty conditions. The aforesaid equipment has been manufactured in compliance with Technical Specifications TS 4345-019-499764972003-2003 and conforms to the Technical Requirements in force.

1. Safety requirements

1.1. When putting the Generator into operation and during operation, “Interbranch Rules for Labor Safety (Safety Rules) When Operating Electrical Systems” (POT PM-016–2001, RD 153-34.0-03.150–00) must be observed.

The symbol



on the Generator’s panel is intended to alert the user to the presence of important operating instructions (MC2.211.001 UM).

1.2. The Generator provides electrical safety according to IEC 61010-1:2010.

1.3. The Generator provides electrical shock protection according to IEC 61010-1:2010.

1.4. Protection provided by the enclosure is per IEC 529-89 — IP20; Mounting Category II; pollution grade 2.

2. Description

2.1. Application

2.1.1. Energoforma 3.3 generates single- and three-phase system of current/voltage signals according to a user-specified model that can be used for testing and adjustment of instruments that measure:

- Active, reactive and apparent power/energy;
- Power quality parameters as per 61000-4-30 power quality measurement standard (classes A, S and B) including harmonics (up to 50th) and interharmonics;
- RMS of currents and voltages within commercial frequency range.

2.1.2. The sphere of application includes mobile calibration (test) laboratories and meter/transformer test systems where the Generator is used together with reference meters, e.g. Energomonitor3.1KM or Energomonitor3.3T1.

The Generator is compliant with the requirements of Electromagnetic Compatibility and Safety (Certificate of Compliance No POCC RU.ME48.C01864).

2.2. Operating conditions

Operating conditions:

- Ambient temperature, °C 10 to 35
- Relative humidity, % 80 at 25 °C
- Atmospheric pressure, kPa (mm Hg) 70–106.7 (537–800).

Energoforma 3.3 is powered from mains: single-phase; (220 ± 22) V, (50 ± 0.1) Hz; THD 5% (or less).

2.3. Delivery package

A particular delivery package for the Generator may be agreed to contain items specified in Table 2.1.

Table 2.1

Delivery package of Energoforma 3.3

Name and description	Order No	Qty
Waveform Generator Energoforma 3.3	MC2.211.001	1
Power supply cable		1
User's Manual	MC2.211.001 UM	1
Equipment Certificate	MC2.211.001 EC	1
Package		1
PC connection cable (RS-232) complete with Adapter USB-4RS232	MC6.705.003	1
“Energoform” software on a Flash drive		1
Set of measurement cables (7 pcs.)		1

2.4. Specifications

2.4.1. The Generator is supplied as a self-contained hand-held module.

The front panel of the Generator bears:

- Graphic display and keyboard;
- Power switch;
- RS-232 interface connector;
- Ground terminal;
- Mains fuses, phase voltage output fuses;
- Phase voltage, phase current and neutral output terminals.

2.4.2. The Generator is provided with three channels for generating voltages (phase voltages) as well as with three independent channels for generating currents. There are two ways to specify the digital model of a signal:

- By selecting one of standard signals from the Generator's internal memory or specifying signal parameters (for a specific signal) using the built-in keyboard;
- By selecting a signal from the Library of standard signals stored on a PC and recording it into the Generator running Energoform software;
- By specifying signal parameters manually from the built-in keyboard.

2.4.3. The Generator supports data transfer to a PC via a serial interface.

2.4.4. Waveforms and parameters of signals are viewed on either built-in graphic LCD display, or on a PC with Energoform software.

2.4.5. The Generator provides for generating currents and voltages for single- and three-phase AC circuits as required within the parameter ranges and permissible error limits specified in Table 2.2.

Table 2.2

Technical Specifications of Energoforma 3.3

Parameter	Value			Notes
	Range	In increments of	Fundamental error of output setting	
1. 1st harmonic frequency of AC current f_1 , Hz	45.0...70	0.01	Absolute: ± 0.01	
2. Nominal values of phase/phase-to-phase voltages U_n , V	220/(220 $\sqrt{3}$); 60/(60 $\sqrt{3}$)	—	—	
3. Nominal values of current I_n , A	1; 10	—	—	
4. RMS of 1st voltage harmonic U_1 , V	20...254	0.001	Relative: 1%	At a nominal load
	254...264			At a 10% load with respect to nominal load
5. RMS of 1st current harmonic I_1 , A	0.05...12	0.0001	Relative: 1%	
	0.005...0.05		Relative: 2%	

Parameter	Value			Notes
	Range	In increments of	Fundamental error of output setting	
6. Harmonic composition				
<i>Harmonics:</i> components with frequencies $f_k = kf_1$ (k from 2 to 50)	2...50	0.01	—	Q-ty: 49
<i>Interharmonics:</i> components with frequencies $f_k = kf_1/2$ (odd numbers k from 1 to 101)	0.5; 1.5; ..., 49.5; 50.5			Q-ty: 51
7. RMS of current or voltage harmonic components, % of U_1 or I_1				
For harmonics from 2nd to 19th	0...100	0.01	—	
For harmonics from 20th to 50th	0...50			
For interharmonics (from 0.5 to 50.5)	0...15			
8. Phase angle between ■ the 1st harmonics of phase voltages in different phases, ■ 1st current and 1st voltage harmonics in the same phase, degrees	-179.99 ... +180	0.01	Absolute: $\pm 2^\circ$	
9. Phase angle between ■ 1st and n th voltage harmonics (interharmonics) in the same phase, ■ 1st and n th current harmonics (interharmonics) in the same phase, degrees	-179.99 ... +180	0.01	—	
10. Total Harmonic Distortion (THD) of voltage, %, or less	—	—	Relative: 1%	$U_1 = 20...254V$, at a linear load
11. Total Harmonic Distortion (THD) of current, %, or less	— —	—	Relative: 1%	$I_1 = 0.05...12 A^*$ at a linear load
12. Instability of RMS of set voltage, no more than, %/min	—	—	Absolute: $\pm 0.03\%$	
13. Instability of RMS of set current, no more than, %/min	—	—	Absolute: $\pm 0.03\%$	
14. Instability of set power, no more than, %/min	—	—	Absolute: $\pm 0.05\%$	
15. Number of dips or swells	0...100 000	1		
16. Voltage dip duration (t), s	0...600	0.001	Absolute: ± 0.002	$f_1 = (50 \pm 1)Hz$
17. Event repetition period (T ; $T \geq t$), s				
18. RMS of dip voltage (U_{min}), % of U_1	0...9.99	0.01	—	$f_1 = (50 \pm 1)Hz$
	10...29.99		Relative: $\pm [1.0 + 0.5(U_H/U - 1)]\%$	
	30...100		Relative: $\pm 1\%$	

Parameter	Value			Notes
	Range	In increments of	Fundamental error of output setting	
19. RMS of swell voltage (U_{\max}), % of U_1	100...200	0.01	Relative: $\pm 0.5\%$	$f_i = (50 \pm 1)\text{Hz}$
20. Power output of current source, VA	5	—	—	At 10A current, $R_n = 0,05\text{Ohm}$
21. Power output of voltage source, VA	10	—	—	At a load of 4.8kOhm

2.4.6. The Generator is considered set for stable operation in 30 minutes (or less) after applying power.

2.4.7. Time of continuous operation of the Generator being powered from mains is maximum 8 hours. At least 1 hour break is required before the next switching on.

2.4.8. Power consumption from mains is 250VA or less.

2.4.9. Overall dimensions (length \times width \times height) — 500 \times 450 \times 200 mm, or less.

2.4.10. Weight is 12 kg, or less.

2.4.11. Mean Time to First Failure (MTFF) is at least 30 000 hours.

2.4.12. Average life cycle is at least 10 years.

3. User Maintenance

3.1. Maintenance is the care and servicing that the user provides for keeping the equipment operational over its life cycle.

3.2. Every maintenance operation shall meet safety requirements described in Section 1 of this Equipment Certificate.

3.3. Routine maintenance includes self-test procedures, cleaning the display and keyboard with a damp cloth, as well as cleaning the oxidized contacts and checking reliability of their fixing.

4. Storage

4.1. Storage conditions of the Generator shall comply with National Standard GOST 15150-69.

4.2. The Generator shall be stored in the manufacturer's package, in a heated storeroom.

Storage conditions in the manufacturer's package:

- Ambient temperature 0 to 40 °C;
- Relative humidity 80% at 35 °C.

Storage conditions without the package:

- Ambient temperature 10 to 35 °C;
- Relative humidity 80% at 25 °C.

4.3. The storeroom should be free from current-conductive dust, acid or alkali fumes and other aggressive substances (as per GOST 15150–69, type 1).

5. Transportation

The Device should be transported packed in the manufacturer's box. The Device can be transported in any enclosed vehicle including air-tight heated plane cargo compartment.

Ambient conditions allowed during transportation:

- Ambient temperature from -30 to $+55$ °C;
- Relative humidity 90 % at 25 °C.

6. Marking and sealing

6.1. Marking

The Generator's front panel bears:

- Model name (Energoforma 3.3);
- Manufacturer's trademark;
- Earthing sign as per IEC 61010-1:2010;
- Power supply type, nominal power supply voltage;
- Sign of disruptive discharge voltage;
- IP20 sign.

The Generator's nameplate bears:

- Serial number;
- Date of manufacture.

6.2. Side and face walls of the transportation box bear handling symbols: "Fragile", "Keep dry" and "Top".

6.3. One seal is installed in the hole of a fastening screw on the leg and the other is on the front panel.

After opening the Generator for repair, the seal shall be reinstalled by an authorized Service Company.

7. Warranty

7.1. All products of MARS-ENERGO are warranted against defects in manufacture or material **for a period of 18 (eighteen) months** from the date of purchase from MARS-ENERGO. Warranty period for the batteries is 6 (six) months from the date of purchase from MARS-ENERGO. Equipment believed to be defective may be sent within the warranty period to MARS-ENERGO for inspection (Warranty Claim enclosed, transportation prepaid). If the inspection carried out by MARS-ENERGO confirms that the product is defective, it will be repaired or replaced (at MARS-ENERGO's option) at no charge, within the limitations specified below, and returned prepaid to the location specified in the buyer's Warranty Claim. All replaced parts become the property of MARS-ENERGO.

7.2. Warranty terms and conditions

In the event of any Device's failure or defect in manufacture or material during the warranty period (provided that the transportation, storage and operating conditions outlined in this Manual are fulfilled), send the Device to MARS-ENERGO along with the sales invoice or other proof of Device's ownership and date of purchase. If the documents outlined in the previous section are absent, the warranty period is calculated from the date of manufacture of the Device.

MARS-ENERGO retains the right to reject a warranty claim, if the documents listed in the previous section are filled out incompletely, incorrectly or illegibly. This warranty will not be applicable for the Devices whose serial number has been altered, removed or made illegible.

This warranty will not be applicable for damages to your Device caused during shipment to and from the location of MARS-ENERGO.

This warranty will not be applicable:

- 1) For parts requiring regular maintenance or replacement due to natural wear;
- 2) For consumable parts (parts, the nature of which is to become worn or depleted with use, such as batteries);
- 3) For damages to the Device caused by:
 - a) any use other than correct use described in the User manual including:
 - Handling the Device resulting in mechanical damages, cosmetic defects, Device modification, or damages to the LCD;
 - Damages caused by incorrect installation;
 - Damages caused by any maintenance other than correct maintenance described in the User manual;
 - Damages caused by installation and use inconsistent with the technical and safety standards in force in the country where the Device has been installed and used;
 - b) Damages caused by computer virus infection or by use of software not supplied by MARS-ENERGO, or damages caused by incorrect software installation;
 - c) Damages caused by condition or defects of a system or its elements with which or as part of which the Device was used, excluding other MARS-ENERGO products intended for use with the Device;
 - d) Damages caused by accessories or ancillary equipment not made or authorized by MARS-ENERGO with respect to their type, condition or characteristics;
 - e) Damages caused by repairs or attempts to repair the Device executed by an unauthorized person or company;

f) Damages caused by adjustments or modifications made to the Device without prior written consent of MARS-ENERGO;

g) Damages caused by negligent handling;

h) Damages caused by accidents, fire, ingress of liquids, chemicals or other materials, flood, vibration, heat, improper ventilation, variations of supply voltage, improper power supply or input voltage, , electrostatic discharge including lightning, or any other impacts or external actions beyond the reasonable control of MARS-ENERGO and not covered by the technical documentation for the Device.

The present warranty only covers hardware failures. This warranty does not cover failures of software (produced either by MARS-ENERGO or by other manufacturers), which are the subject of express or implied end user license agreements, separate warranties, or exclusions.

7.3. MARS-ENERGO establishes the lifetime for the products outlined above (excluding the batteries) of 4 (four) years from the date of purchase from MARS-ENERGO. Warranty period for the batteries is 2 (two) years from the date of purchase from MARS-ENERGO. *Please note that warranty period and lifetime differ from each other.*

7.4. It is highly recommended to make a backup copy of the data from the Device's internal memory and store it on another (external) media. MARS-ENERGO shall in no circumstances be liable for any direct or indirect damages or losses, whether incidental, consequential or otherwise, including but not limited to loss of profits, loss of use or any deletion, corruption, destruction or removal of data, disclosure of confidential information or infringement of privacy, data recovery expenses, losses arising out of interruption of commercial, production or other activities based on use or loss of use of the Device.

Manufacturer's address for warranty claims:

ESME

Kalda tn. 9, Narva, Estonia, 20103

Tel.: +372 568 099 99

E-mail: mail@esme.ee; esmeou@gmail.com

8. Packing Form

Three-phase Programmable Waveform Generator Energoforma 3.3 _____
 No _____.

The aforesaid equipment has been packed by ESME in compliance with the Technical Requirements in force.

Packer signature _____ (*Initials and name*)

Date: _____

9. Acceptance Form

Three-phase Programmable Waveform Generator Energoforma 3.3 _____
 No _____.

The aforesaid equipment has been manufactured and accepted in compliance with Technical Specifications TS 4345-019-49976497–2003.

Head of Quality Control Department _____ (*Initials and name*)

Corporate Seal:

Date: _____

Date of sale _____

Corporate Seal: _____ (*Initials and Name*)

10. Warranty Claim

In the event of any Device's failure or defect in manufacture or material during the warranty period (provided that the transportation, storage and operating conditions outlined in this Manual are fulfilled), send the Device to ESME along with the Warranty Claim containing the following information:

- Device's model and serial number; date of manufacture; date of putting the Device into operation;
- Condition of the manufacturer's seals (in place, destroyed, absent);
- Description of the failure or defect;
- Buyer details (Company name, address, etc., including name and phone number of whom the reply may concern).