



Calibrator of digital streams
MarsGen-61850

Equipment Certificate

MC2.211.502 EC

Manufacturer: OOO “NPP Mars-Energo”

Legal address:

V.O. 13 Line, 6-8, Office 41H, St. Petersburg, Russia, 199034

Table of contents

INTRODUCTION	3
1 SAFETY REQUIREMENTS.....	3
2 DESCRIPTION	4
2.1 General.....	4
2.2 Operating conditions	4
2.3 Scope of supply.....	4
2.4 Specifications.....	5
3 MAINTENANCE	10
4 STORAGE	10
5 TRANSPORTATION	11
6 MARKING AND SEALING	11
7 MANUFACTURER’S WARRANTY	11
8 PACKING FORM.....	14
9 ACCEPTANCE FORM	14
10 WARRANTY CLAIM.....	15

INTRODUCTION

This Equipment Certificate contains such information about the Calibrator of digital streams MarsGen-61850 (the Calibrator below) as manufacturer's warrantee, specifications, scope of supply, packing form, and acceptance form. The Calibrator is manufactured in compliance with Technical Specifications MC2.211.502 TS.

1 SAFETY REQUIREMENTS

1.1 The Calibrator belongs to the equipment compliant with the requirements of Russian "Rules for Labour Safety When Operating Electrical Installations".

1.2 As regards protection against electrical shock, the Calibrator relates to the equipment of protection class I.

1.3 The Calibrator meets the requirements of Russian Standard GOST 12.2.091 ("Safety requirements for electrical equipment for measurement, control, and laboratory use"). In terms of GOST 12.2.091, it is characterized by:

- Category of insulation – basic
- Category of measurements – III
- Pollution grade – 1

1.4 Ingress protection code is IP20 (Russian Standard GOST 14254).

1.5 The Calibrator must be connected to the grounding bus before it is connected to power supply.

2 DESCRIPTION

2.1 General

2.1.1 Purpose

The Calibrator generates digital signals in the form of SV (sampled values) streams (according to IEC 61850-9-2) on the basis of predefined signal settings such as the parameters of DC current and voltage signals as well as the parameters defining composite AC current and voltage waveforms containing harmonics up to 50th along with the parameters of electrical power, power quality, and phase shifts between signal components.

2.2 Operating conditions

- Ambient temperature, °C From -10 to +40
- Relative humidity, % Up to 98 at 25 °C
- Atmospheric pressure, kPa From 84 to 106.7

Operating position: horizontal

Power supply: mains voltage (230±10%) V, (50 ± 0.5) Hz, THD 5%, or less

2.3 Scope of supply

Table 2.1

Name	Designation	Q-ty
Calibrator MarsGen-61850	MC2.211.502	1
USB drive with SM-61850 software for Windows		1
Ethernet cable, 2 m (RJ-45 - RJ-45)		1
Set of accessories		1 set*
User Manual	MC2.211.502 UM	1 copy
Equipment Certificate	MC2.211.502 ΦO	1 copy
Note: *As specified in the Supply Agreement (selected from Table 2.2)		

Table 2.2 – Optional accessories

Name	Designation	Q-ty *	Notes
Mediaconverter Ethernet-FO with power supply unit		1	
Ethernet switch		1	
Antenna		1	For model “-01”
Cable BNC-BNC, blue, 2 m XLSS-58	67.9770-200.23	1	High-frequency

Name	Designation	Q-ty *	Notes
Cable BNC-BNC, red, 2 m XLSS-58	67.9770-200.22	1	High-frequency
Signal distributor XM-FF	67.9783-21	1	1BNC(M)-2BNC(F)
Signal coupler XF-F	67.9547-28	1	BNC(F)-BNC(F)
Note: * The quantity may be changed, if specified in the supply agreement			

2.4 Specifications

2.4.1 The Calibrator generates signals within the ranges and with the limits of permissible error of output setting specified in Table 2.3.

The ranges of output setting:

- For current: 0.001 to 1500000 A
- For voltage: 0.01 to 15000000 V.

In table 2.3, the terms “Voltage”, “Voltage of harmonic“, “Current”, and “Current of harmonic” relate to the RMS values of these parameters.

Table 2.3 – Specifications

Parameter	Range	Limits of permissible error of output setting (absolute Δ , with respect to reference value δ , with respect to nominal value γ)	Notes
Phase (line) voltage and voltage of fundamental harmonic (U and $U_{(1)}$), V ¹⁾	$U > 10 \text{ V}$	$\pm 0.03 \% (\delta)$	-
	$U \leq 10 \text{ V}$	$\pm 0.003 \text{ B } (\Delta)$	-
Current and current of fundamental harmonic (I and $I_{(1)}$), A ¹⁾	$I > 1 \text{ A}$	$\pm 0.03 \% (\delta)$	-
	$\leq 1 \text{ A}$	$\pm 0.0003 \text{ A } (\Delta)$	
Fundamental frequency f , Hz	40 to 500	$\pm 0.0003 \% (\delta)$	-
Phase shift between voltages of fundamental harmonic in different phases, degrees	-180 to 180°	$\pm 0.03 \text{ degrees } (\Delta)$	$U > 10 \text{ V}$ $I > 1 \text{ A}$
		$\pm 0.05 \text{ degrees } (\Delta)$	$1 \text{ V} \leq U \leq 10 \text{ V}$ $0.1 \text{ A} \leq I \leq 1 \text{ A}$
Phase shift between currents of fundamental harmonic in different phases, degrees	-180 to 180°	$\pm 0.03 \text{ degrees } (\Delta)$	$U > 10 \text{ V}$ $I > 1 \text{ A}$
		$\pm 0.05 \text{ degrees } (\Delta)$	$1 \text{ V} \leq U \leq 10 \text{ V}$ $0.1 \text{ A} \leq I \leq 1 \text{ A}$
Phase shift between fundamental harmonics of current and voltage in the	-180 to 180°	$\pm 0.03 \text{ degrees } (\Delta)$	$U > 10 \text{ V}$ $I > 1 \text{ A}$

Parameter	Range	Limits of permissible error of output setting (absolute Δ , with respect to reference value δ , with respect to nominal value γ)	Notes
same phase, degrees		± 0.05 degrees (Δ)	$1 \text{ V} \leq U \leq 10 \text{ V}$ $0.1 \text{ A} \leq I \leq 1 \text{ A}$
Power quality parameters			
Phase (line) overdeviation of voltage $\delta U_{(+)}$, %	0 to 100	± 0.03 % (γ)	In % of declared voltage U_{din} U_{din} (over 10 V)
Phase (line) underdeviation of voltage $\delta U_{(-)}$, %	0 to 100	± 0.03 % (γ)	
Steady-state deviation of phase (line) voltage δU_{st} , %	-100 to +100	± 0.03 % (γ)	
Negative sequence voltage ratio K_{2U} , %	0 to 50	± 0.03 % (Δ)	$U > 10 \text{ V}$
Zero sequence voltage ratio K_{0U} , %	0 to 50	± 0.03 % (Δ)	$U > 10 \text{ V}$
RMS value of the n^{th} harmonic of phase (line) voltage $U_{(n)}$, V $n = 2$ to 50	0 to $0.6 \cdot U_{(1)}$	± 0.01 B (Δ)	$U_{(n)} \leq 1.0$
		± 1.0 % (δ)	$U_{(n)} > 1.0$
Ratio of the n^{th} harmonic of phase (line) voltage $K_{U(n)}$, % $n = 2$ to 50 (With respect to fundamental harmonic)	0 to 60	± 0.01 % (Δ)	$K_{U(n)} \leq 1.0$
		± 1.0 % (δ)	$K_{U(n)} > 1.0$
Total Harmonic Distortion of voltage THD_U , %	0 to 50	± 0.01 % (Δ)	$K_U \leq 1.0$
		± 1.0 % (δ)	$K_U > 1.0$
RMS value of the m^{th} interharmonic of phase (line) voltage $U_{(m)}$, V $m = 0.1$ to 49.5 (in increments of 0.1)	0 to $0.5 \cdot U_{(1)}$	± 0.01 B (Δ)	$U_{(m)} \leq 1.0$
		± 1.0 % (δ)	$U_{(m)} > 1.0$
Ratio of the m^{th} interharmonic of phase (line) voltage $K_{U(m)}$, %	от 0 до 50	± 0.01 % (Δ)	$K_{U(m)} \leq 1.0$

Parameter	Range	Limits of permissible error of output setting (absolute Δ , with respect to reference value δ , with respect to nominal value γ)	Notes
m = 0.1 to 49.5 (in increments of 0.1) (With respect to fundamental harmonic)		$\pm 1.0\%$ (δ)	$K_{U(m)} > 1.0$
Frequency deviation Δf (deviation from nominal frequency f_{NOM}), Hz	-10 to +10	$\pm 0.0003\%$ (δ)	$F_{NOM} = 50$ Hz
Negative sequence current K_{2I} , %	0 to 50	$\pm 0.03\%$ (Δ)	$I > 1$ A
Zero sequence current K_{0I} , %	от 0 до 50	$\pm 0.03\%$ (Δ)	$I > 1$ A
RMS value of the n th harmonic of current $I_{(n)}$, A N = 2 to 50	0 to 0.6· I ₍₁₎	± 0.01 A (Δ)	$I_{(n)} \leq 0.01$
		$\pm 1.0\%$ (δ)	$I_{(n)} > 0.01$
Ratio of the n th harmonic of current $K_{I(n)}$, % n= 2 to 50 (With respect to fundamental harmonic)	от 0 до 50	$\pm 0.01\%$ (Δ)	$K_{I(n)} \leq 1.0$
		$\pm 1.0\%$ (δ)	$K_{I(n)} > 1.0$
Total Harmonic Distortion of current THD _I , %	от 0 до 50	$\pm 0.01\%$ (Δ)	$K_I \leq 1.0$
		$\pm 1.0\%$ (δ)	$K_I > 1.0$
RMS value of the m th interharmonic of current $I_{(m)}$, A m = 0.1 to 49.5 (in increments of 0.1)	0 to 0.5·I ₍₁₎	± 0.01 A (Δ)	$I_{(m)} \leq 0.01$
		$\pm 1.0\%$ (δ)	$I_{(m)} > 0.01$
Ratio of the m th interharmonic of current $K_{I(m)}$, % m = 0.1 to 49.5 (in increments of 0.1) (With respect to fundamental harmonic)	от 0 до 50	$\pm 0.01\%$ (Δ)	$K_{I(m)} \leq 1.0$
		$\pm 1.0\%$ (δ)	$K_{I(m)} > 1.0$
Events			
Voltage dip duration Δt_D , s	0,02 to 600	± 0.005 s (Δ)	-
Voltage dip depth δU_D , %	0 to 100	$\pm 0.05\%$ (Δ)	-
Residual voltage of voltage dip U_{res} , V	0.01 to 0.9U _{din}	$\pm 0.05\%$ (δ)	
Duration of voltage interruption Δt_{INT} , s	0.01to 3600	± 0.005 s (Δ)	-

Parameter	Range	Limits of permissible error of output setting (absolute Δ , with respect to reference value δ , with respect to nominal value γ)	Notes
Maximum magnitude of voltage swell U_{SW} , V	1.1 to $2U_{din}$	$\pm 0.05\%$ (δ)	-
Duration of voltage swell Δt_{SW} , s	0.02 to 600	± 0.005 c (Δ)	-
Short-term P_{St} and long-term P_{Lt} severity of Flicker, relative units	0.2 to 10	$\pm 1.5\%$ (δ)	-
Electrical power			
Power factor (PF=P/S)	-1 to +1	± 0.003 (Δ)	-
Phase active power (P_A , P_B , P_C) and 3-phase active power (P), phase active power of fundamental harmonic ($P_{A(1)}$, $P_{B(1)}$, $P_{C(1)}$) and 3-phase active power ($P_{(1)}$) of fundamental harmonic, active power of positive (P_1), zero (P_0), and negative (P_2) sequence, W	10 to $15 \cdot 10^{12}$	$\pm 0.03\%$ (δ)	$U > 10$ V $I > 1$ A
	0.01 to 10	± 0.003 (Δ)	$1 \text{ V} \leq U \leq 10 \text{ V}$ $0.1 \text{ A} \leq I \leq 1 \text{ A}$
Phase reactive power (Q_A , Q_B , Q_C) and 3-phase reactive power (Q), phase reactive power of fundamental harmonic ($Q_{A(1)}$, $Q_{B(1)}$, $Q_{C(1)}$) and 3-phase reactive power of fundamental harmonic ($Q_{(1)}$), reactive power of positive (Q_1), zero (Q_0), and negative sequence (Q_2), Var	From 10 to $15 \cdot 10^{12}$	$\pm 0.1\%$ (δ)	$U > 10$ V $I > 1$ A
	0,01 to 10	± 0.01 (Δ)	$1 \text{ V} \leq U \leq 10 \text{ V}$ $0.1 \text{ A} \leq I \leq 1 \text{ A}$
Phase apparent power (S_A , S_B , S_C) and 3-phase apparent power (S), phase apparent power of fundamental harmonic ($S_{A(1)}$, $S_{B(1)}$, $S_{C(1)}$) and 3-phase apparent power of fundamental harmonic ($S_{(1)}$), apparent power of positive (S_1), zero (S_0), and negative sequence (S_2), VA	от 10 до $15 \cdot 10^{12}$	$\pm 0.1\%$ (δ)	$U > 10$ B $I > 1$ A
	0.01 to 10	± 0.01 (Δ)	$1 \text{ V} \leq U \leq 10 \text{ V}$ $0.1 \text{ A} \leq I \leq 1 \text{ A}$
Frequency of reference (timing) signal 1PPS	1 Hz	$\pm 2 \cdot 10^{-6}$ (δ)	-

2.4.2 The variation of set values of RMS current and voltage signal is 0.02 %/min.

2.4.3 In terms of functionality, the Calibrator comes in various modifications. This is indicated in the model name:

MarsGen-61850-XX, where

positions XX relates to functionality:

"00" – without additional functions

"01" – PTP (Precision Time Protocol) receipt/transmission of signals is available.

2.4.4 General specifications are listed in Table 2.4.

Table 2.4 – General specifications

Parameter	Value
Power consumption, VA	30, or less
Synch signals (input/output interfaces)	1PPS, 10 MHz (TTL-BNC); PTP (Ethernet RJ-45) ¹⁾
Sampling frequency (IEC 61850-9-2), samples per second в секунду	4000 to 38400
Max number of output SV streams (Sampled Values 9-2 LE)	2
Number of Ethernet ports	3 4 ¹⁾
Overall dimensions, mm	
- Height	137
- Width	290
- Depth	335
Weight, kg	9
Operating conditions:	
- Ambient temperature, °C	-10 to +40
- Relative humidity, %	Up to 98 at 25 °C
- Atmospheric pressure, KPa	84 to 106,7
Time to stable operation, min	10, or less
Time of continuous operation, h	At least 16
Time to first failure, h	20000
Average lifetime, years	10
¹⁾ – For the model "01"	

3 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 the safety measures described in this Equipment Certificate.

3.3 Routine maintenance includes self-testing, cleaning the surfaces with a damp cloth, cleaning oxidized contacts and checking the reliability of their fixing.

3.4 Troubleshooting

N	Fault	What to do
1	The Calibrator does not start	Check connection of power supply cables Replace fuses
2	There is no connection between the Calibrator and Control Terminal	Check port settings Check communications cable

4 STORAGE

4.1 The Calibrator must be stored in compliance with Storage conditions 3 as stated in Russian State Standard GOST 15150-69.

4.2 Long-term storage must be performed in a heated storeroom in the manufacturer's package.

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 corrosive dust, acid or alkali fumes and other aggressive substances. Concentration of corrosive components in the air must not exceed the values stated in Russian national standard GOST 15150-69 (the atmosphere of type 1), namely

Concentration limits of corrosive components in the air:

Sulfur dioxide gas – maximum 20 mg / (m² · day) (maximum 0.025 mg/m³)

Chlorides – 0.3 mg / (m² · day).

5 TRANSPORTATION

5.1 The Calibrator should only be transported packed in the manufacturer's box in an enclosed vehicle or train wagon protected from atmospheric precipitation, or by air in an air-tight heated cargo compartment.

5.2 Transportation conditions:

- Ambient temperature: from –25 to 50 °C
- Relative humidity: 98% at 35 °C

The parameters of transportation bounce (regulated by Russian state standard GOST 22261, group 2) are as follows:

- Maximum number of strikes per minute: 80...120
- Maximum acceleration (m/s^2): 30
- Duration of exposure (h): 1

6 MARKING AND SEALING

6.1 The front panel of the Calibrator bears:

- Model name
-  conformity mark indicating compliance with the Technical Regulations of the Customs Union
- Serial number
- Date of manufacture
- Ingress protection rating (IP20);
- Manufacturer's name and trademark
- Power supply type and rating
- Input and output connector designations.

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

6.3 A seal is installed in a hole of a fastening screw. After opening the Calibrator for repair, the seal must be reinstalled by an authorized service company only.

7 MANUFACTURER'S WARRANTY

7.1 All of the warranty provisions stated below operate under the laws of Russian Federation which govern the protection of consumer rights.

7.2 All of the Devices produced by Mars-Energy are warranted to conform to the specifications stated in the Equipment Certificate for a period of 18 (eighteen) months from the date of purchase. Warranty period for the batteries is 6 (six) months from the date of purchase. The Device believed to be defective may be sent within the warranty period to Mars-Energy for inspection (Warranty Claim enclosed, transportation prepaid). If the inspection carried out by Mars-Energy confirms that the Device is defective, it will be repaired or replaced (at manufacturer's option) at no charge, within the underlisted limitations (paragraph 9.3), and returned prepaid to the location specified in the buyer's Warranty Claim. All replaced parts become the property of Mars-Energy.

Conditions

7.3 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-Energy along with the sales invoice or other proof of Device's ownership and date of purchase. If these documents are absent, the warranty period is calculated from the date of manufacture of the Device.

Mars-Energy 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 to the Devices whose serial number has been altered, removed or made illegible.

This warranty will not cover the damages to your Device caused during shipment to and from Mars-Energy.

This warranty will not be applicable for:

- 1) Parts requiring regular maintenance or replacement due to natural wear
- 2) Consumable parts (parts, the nature of which is to become worn or depleted with use, such as batteries)
- 3) 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 or visual defects, modification of the Device, or damages to the LCD
 - Incorrect installation
 - Any maintenance other than correct maintenance described in the User manual
 - Installation and use inconsistent with the technical and safety standards that are in force in the country where the Device has been installed and used
 - b) Computer virus infection or by use of software not supplied by Mars-Energy, or damages caused by incorrect software installation
 - c) Condition or defects of a system or its elements with which or as part of which the Device was used, excluding other Mars-Energy's products intended for use with the Device
 - d) Accessories or ancillary equipment not made by Mars-Energy or authorized by Mars-Energy for use with the Device with respect to the type, condition or characteristics of this equipment
 - e) Repair or attempts to repair the Device executed by an unauthorized person or company
 - f) Adjustments or modifications made to the Device without prior written consent of Mars-Energy
 - g) Negligent handling
 - h) 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-Energy 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-Energy or by other manufacturers), which are the subject of express or implied end user license agreements, separate warranties, or exclusions

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-Energy 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

7.5 The Warranty terms and conditions for the Devices purchased by a legal entity are specified in the Supply Agreement. The Warranty obligations in this case are governed by Civil Law.

Manufacturer's address (for warranty claims):

ООО "NPP Mars-Energo"

V.O. 13 Line, 6 - 8, office 41H, St. Petersburg, Russia, 199034

Tel/Fax: (812) 327-21-11, (812) 331-87-35 (812) 334-72-41

E-mail: mars@mars-energo.com

Web-site: www.mars-energo.com

E-mail: mail@mars-energo.ru

www.mars-energo.ru

8 PACKING FORM

Calibrator of digital streams MarsGen-61850_____, serial number_____

was packed by ООО “NPP Mars-Energo” in compliance with corporate Technical Requirements in force.

Packer _____ (Signature and name)

Date_____

9 ACCEPTANCE FORM

Calibrator of digital streams MarsGen-61850_____, serial number_____

was manufactured in compliance with its Technical Specifications and approved as ready for use.

Acceptance supervisor _____ (Signature and name)

Corporate seal

Date_____

10 WARRANTY CLAIM

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

- 1) Model and Serial number of the equipment
- 2) Date of manufacture
- 3) Date of putting the equipment into operation
- 4) Condition of the manufacturer's seals (in place, destroyed, absent). See section 6 for the location of the seals.
- 5) Description of the failure or defect;
- 6) Buyer details (Company name, address, etc., including name and phone number of whom the reply may concern).

Find the Serial number and Date of manufacture of the equipment on its nameplate.