

Shunt Meter Calibration Device

SMCD-3

User manual

MC2.763.002 UM

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Introduction

This user manual describes the SMCD-3 unit (the Device below) designed for testing electrical energy meters with closed current and voltage circuits (so called “shunt” meters) and contains information about its operation, maintenance, warranty, transportation and storage conditions.

The Device comes in two modifications:

SMCD-3-01 – connections to other equipment via terminals

SMCD-3-02 –connections to other equipment via sockets



Fig. 1 SMCD-3

1. Safety requirements

1.1 When putting the Device into operation and during operation, “Interbranch Rules for Labor Safety (Safety Rules) When Operating Electrical Systems” (2001) must be observed.

1.2. Under normal operation, the electrical resistance of the insulation between the secondary windings of the Device and its enclosure is at least 20 MOhm. The electrical resistance of the Device’s primary winding with respect to its secondary windings and with respect to its enclosure is at least 40 MOhm.

1.3. Under normal test conditions, the insulation of the Device’s primary winding with respect to its secondary winding and the Device’s primary and secondary windings with respect to its enclosure provides for withstanding an AC test voltage of 1 kV (RMS), 50 Hz during 1 minute.

1.4. The grounding bolt (according to “Interbranch Rules for Labor Safety (Safety Rules) When Operating Electrical Systems up to 1000V”) is mounted on the Device’s enclosure.

1.5. All connections (disconnections) to the Device must be made only when the Device is de-energized.

1.6. Only qualified personnel (certified for the qualification level 3 or higher) trained and knowledgeable in the safe handling of the Device should attempt to repair the Device, perform its routine maintenance or make any connections to it.

2. Description

2.1. Scope of application

2.1.1. The Device is designed as an auxiliary unit for simultaneous testing or adjustment of 3 electrical energy meters with closed current and voltage links.

2.1.2. The Device is typically used as part of test systems for testing, adjustment and calibration of electrical energy meters.

2.2. Operating conditions

2.2.1. The Device is designed for indoor use. It should be installed in dry and heated rooms.

2.2.2. Normal conditions

- Ambient temperature, °C 20 ± 5
- Relative humidity, % 30–80

2.2.3. Operating conditions

- Ambient temperature, °C от 10 до 35
- Relative humidity, % up to 80 at 25 °C

2.3. Scope of supply

2.3.1. The scope of supply is given in Table 2.1.

Table 2.1

Name and description	Order #	Qty
SMCD-3		1
Set of cables		1
User manual		1
Package		1

2.4. Design

2.4.1. The Device is designed as a stand-alone module with the connectors for meters under test and the ones for connecting to the test system located on its front (Fig. 2.1) and rear (Fig. 2.2) panels. Refer to Fig. 1 and 2 of the Appendix for making the connections.

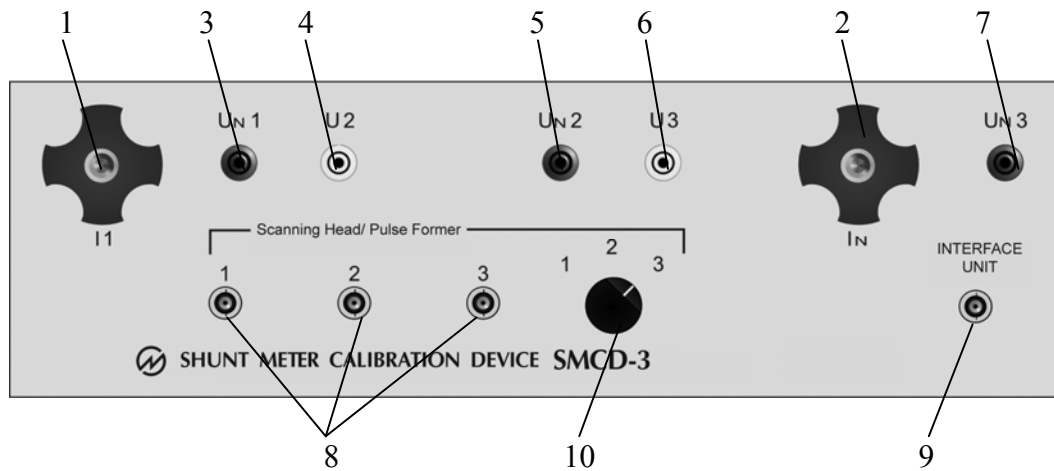


Fig. 2.1 Front panel

- 1 — I_1 connector (for connection of the current input of the 1st meter under test)
 2 — I_N connector (for connection of the current output of the last meter under test)
 3 — U_{N1} connector (for connection of the neutral voltage conductor of the 1st meter under test)
 4 — U_2 connector (for connection of the phase voltage conductor of the 2nd meter under test)
 5 — U_{N2} connector (for connection of the neutral voltage conductor of the 2nd meter under test)
 6 — U_3 connector (for connection of the phase voltage conductor of the 3rd meter under test)
 7 — U_{N3} connector (for connection of the neutral voltage conductor of the 3rd meter under test)
 8 — “Scanning Head/Pulse Former” 1, 2, 3 connectors (for connection of meter scanning devices (scanning heads or pulse formers) of the 1st, 2nd, and 3rd meter respectively)) 9 — “INTERFACE UNIT” connector (for connection to the Interface Unit, if present in the delivery package) 10 — Rotary switch “1, 2, 3” (for connecting the meter scanning devices (scanning heads or pulse formers) to the Interface Unit one by one)

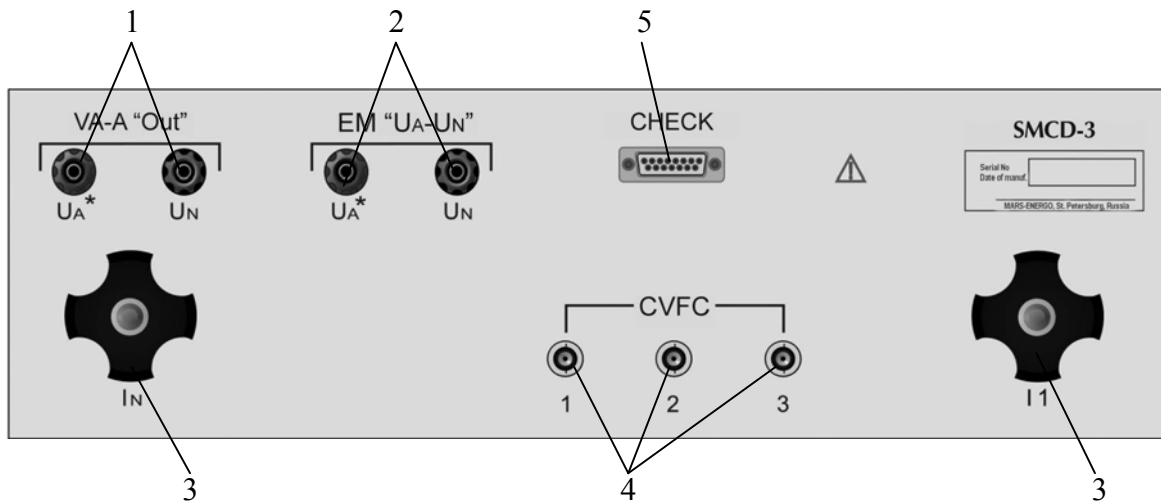


Fig. 2.2. Rear panel

- 1 — VA-A “Out” terminals (for connection to the Phase A “Output” terminals of the Voltage Amplifier VA3.1) 2 — EM “ U_A-U_N ” terminals (for connection to the U_a and U_n voltage input terminals of the EM3.1KM — at this time, the U_a and U_n terminals of the EM3.1KM should be disconnected from the Phase A terminals of the voltage amplifier VA 3.1) 3 — I_1 , I_N terminals (for connection to the Phase A current output terminals of the Test Bench SMD3) 4 — CVFC 1, 2, 3 connectors (for connection to 3 error calculators Calmar-SL (CVFC is the former name) 5 — CHECK connector (used to check the input and output windings of the isolating voltage transformer)

2.4.2. To test or adjust several meters with closed U and I links, it is necessary to use an isolating voltage transformer (or isolating current transformers).

The Device comprises an isolating voltage transformer which provides a difference in the ratio and angle values in its channels of no more than 0.05% and 3 minutes respectively (provided that the loads on these channels vary by no more than 50% from each other).

2.5. Specifications

2.5.1. The specifications are given in Table 2.2.

Table 2.2

Parameter	Value
Input AC voltage	220 ± 22 V
AC frequency of the measured circuit	50 ± 1 Hz
Total power consumption	40 VA
Power factor	5 %, or less
Highest voltage	242 V
Highest current	100 A
Electrical resistance of the insulation between the enclosure and the electrical circuits under normal conditions	40 MOhm, or more
Rated primary voltage	220 V
Rated secondary voltage	220 V
Total burden on each secondary winding of the isolating transformer	No less than 10 VA (active power no less than 2 W)
Highest relative difference in the values of voltage in the secondary winding 1 and in any other secondary winding ^{1,2}	±0.05 %
Highest relative difference in the phases of signals in the secondary winding 1 and in any other secondary winding ^{1,2}	±3'
Permissible limit of the transformer ratio error (relative) ¹	±2 %
Time of continuous operation (at the rated voltage)	8 hours, or more
Interval between operation cycles (no voltage applied)	1 h
Mean time to failure	160 000 h, or more
Average lifetime	30 years, or more
Dimensions (depth × width × height)	508 × 483 × 132 mm
Weight	12 kg, or less

¹ Within the primary voltage range from 80 % to 120 % of the rated voltage

² Provided that the difference in the load impedances of these windings does not exceed ±10 %

2.5.2. Under operating conditions, the Device provides the above characteristics immediately after applying power.

2.6. Operation

2.6.1. Making connections

Refer to Fig. 1 and 2 of the Appendix for making the connections between the Device, meters under test and MTS ME 3.1KM.

The Device is connected to the MTS ME 3.1KM test system in the following order:

1. Disconnect the Phase A voltage terminals of the voltage amplifier VA-3.1 from the U_a and U_n voltage input terminals of the EM3.1KM. Connect the Phase A voltage terminals of the VA-3.1 to the EM “U_A-U_N” terminals of the Device (red to red and black to black).

From this time, the output voltage of the VA-3.1 is applied to the primary (input) winding of the isolating voltage transformer inside the SMCD.

2. Using factory-supplied cables connect the EM “ U_A-U_N ” terminals of the Device to the U_a and U_n voltage input terminals of the EM3.1KM. From this moment, the secondary winding 1 of the isolating transformer is connected to the input voltage terminals of the reference meter, thus, one and the same voltage is applied to the EM3.1KM and to the 1st meter under test.

Note!

When using the Device, the 1st meter under test must ALWAYS be connected.

3. Using factory-supplied cables, connect the I_A^* terminal of the test bench SMD3 to the I_1 terminal on the rear panel of the Device. Connect the I_{A0} terminal of the test bench SMD3 to the I_N terminal on the rear panel of the Device.

4. Connect the meters under test to the front panel terminals of the Device (refer to the Appendix):

a) Connect the I_1 terminal on the front panel of the Device to the current input of the 1st meter under test by a factory-supplied cable. The phase voltage across the winding 1 of the isolating transformer will be applied to the 1st meter under test with the same cable. The “neutral voltage” contact of the 1st meter under test is connected to the U_{N1} terminal on the front panel of the Device.

b) With a factory-supplied jumper, connect the current output of the 1st meter under test with the current input of the 2nd meter. The tap wire on the jumper is connected to the U_2 terminal on the front panel of the Device. The “neutral voltage” contact of the 2nd meter under test is connected to the U_{N2} terminal on the front panel of the Device.

c) With a factory-supplied jumper, connect the current output of the 2nd meter under test with the current input of the 3rd meter. The tap wire on the jumper is connected to the U_3 terminal on the front panel of the Device. The “neutral voltage” contact of the 3rd meter under test is connected to the U_{N3} terminal on the front panel of the Device.

d) Using a factory-supplied wire, connect the I_N terminal on the front panel of the Device with the current output of the 3rd meter under test.

5. Connect scanning heads or pulse formers to the corresponding connectors 1, 2, 3 (use the scanning heads for the meters with pulse LEDs and pulse formers for the meters with pulse (telemetry) outputs).

6. Connect the SH connectors on the error calculators Calmar-S to the CVFC connectors on the rear panel of the Device. Connect the Pulse Output TTL of the EM 3.1KM to the F_{out} (Reference device) connectors of each error calculator with a 3-output BNC adapter.

2.6.2. Determining meter errors

With the Calmar-S error calculators, the measurement errors of meters under test are determined automatically in the EnfCalibrationRig program (refer to the EnfCalibrationRig user manual for details).

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 user manual.

3.3. The routine maintenance includes cleaning the work surfaces with a damp cloth, cleaning the oxidized contacts and checking the reliability of their fixing.

4. Storage

4.1 The Device 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

4.2 The storeroom should be free from current-conductive dust, acid or alkali fumes and other aggressive substances.

5. Transportation

5.1. The Test bench shall be transported packed in the manufacturer’s box. The Test bench can be transported in any enclosed vehicle including air-tight heated plane cargo compartment.

Ambient conditions during transportation:

- Ambient temperature -25 to 50 °C
- Relative humidity 90 % at 25 °C

6. Marking

6.1. The manufacturer’s nameplate bears:

- Model name
- Manufacturer’s trade mark

6.2. The side and face walls of the transportation box bear handling symbols “Fragile” and “Keep dry”.

7. Warranty

7.1 The Shunt Meter Calibration Device SMCD-3 (the Product below) is warranted against defects in manufacture or material **for a period of 18 (eighteen) months** from the date of purchase from the manufacturer. The Product believed to be defective may be sent within the warranty period to the manufacturer for inspection (the warranty claim enclosed, transportation prepaid). If the inspection confirms that the Product is defective, it will be repaired or replaced (at manufacturer's option) at no charge, within the limitations specified below (paragraph 9.2), and returned prepaid to the location specified in the buyer's warranty claim. All replaced parts become the property of the manufacturer.

7.2 Conditions

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

The Manufacturer retains the right to reject a warranty claim in the following cases:

- 1) The warranty claim is filled out incompletely, incorrectly or illegibly
- 2) The Product has:

- Serial number altered or removed or illegible
- Broken seal with the calibrator's stamp

This warranty is not applicable for:

- 1) Damages to the Product caused during shipment to and from the Manufacturer's site
- 2) Parts requiring regular maintenance or replacement due to natural wear
- 3) Consumable parts (parts, the nature of which is to become worn or depleted with use)
- 4) Damages to the Product caused by:
 - a) Any use other than correct use described in the User's Manual including:
 - Handling of the Product resulting in mechanical damages or other defects including any changes or modifications to the Product
 - Installation or use of the Product in a manner inconsistent with the technical and safety laws or standards in force in the country where it is installed or used
 - Any maintenance other than correct maintenance described in the User's Manual
 - b) Damages caused by condition or defects of a system or its elements with which or as part of which the Product was used, excluding the other Manufacturer's products intended for use with the Product
 - c) Damages caused by accessories or ancillary equipment not made or authorized by the Manufacturer with respect to their type, condition or characteristics
 - d) Damages caused by repairs or attempts to repair the Product executed by an unauthorized person or company
 - e) Damages caused by adjustments or modifications made to the Product without prior written consent of the Manufacturer
 - f) Damages caused by negligent handling
 - g) 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 the Manufacturer and not covered by the technical documentation for the Product

7.3. The Manufacturer establishes the lifetime for the products outlined above of 4 (four) years from the date of purchase from the Manufacturer. *Please note that the warranty period and lifetime differ from each other.*

7.4. The Manufacturer 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 Product.

Manufacturer's address (for warranty claims):

Russia

OOO NPP Mars-Energy

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

Tel: +7 812 327-21-11; +7 812 331-87-35

E-mail: mail@mars-energo.ru

www.mars-energo.com

Estonia

ESME OU

Kadastiku 25a, Narva, Estonia 21004

Tel: +372 56809999

E-mail: mail@esme.ee

8 Packing Form

Shunt Meter Calibration Device SMCD-3 ____, serial N _____
has been packed by the Manufacturer in compliance with the Technical Re-
quirements in force.

Packer signature: _____ (Initials and Name)

Date: _____

9 Acceptance Form

Shunt Meter Calibration Device SMCD-3 ____, serial N _____ has been
manufactured in compliance with Technical Specifications
TS 4381-053-49976497-2013 and conforms to the Technical Requirements in
force.

Head of Quality Control Department: _____ (Initials and Name)

Corporate Seal:

Date: _____

Date of sale _____

Corporate Seal:

10. Warranty Claim

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

- 1) Model and serial number
- 2) Date of manufacture
- 3) Date of putting the Product into operation
- 4) Condition of the manufacturer's seals (in place, destroyed, absent)
- 5) Description of the failure or defect
- 6) Buyer details (Company name, address, etc., including the name and phone number of a contact person).

Appendix Connection diagrams

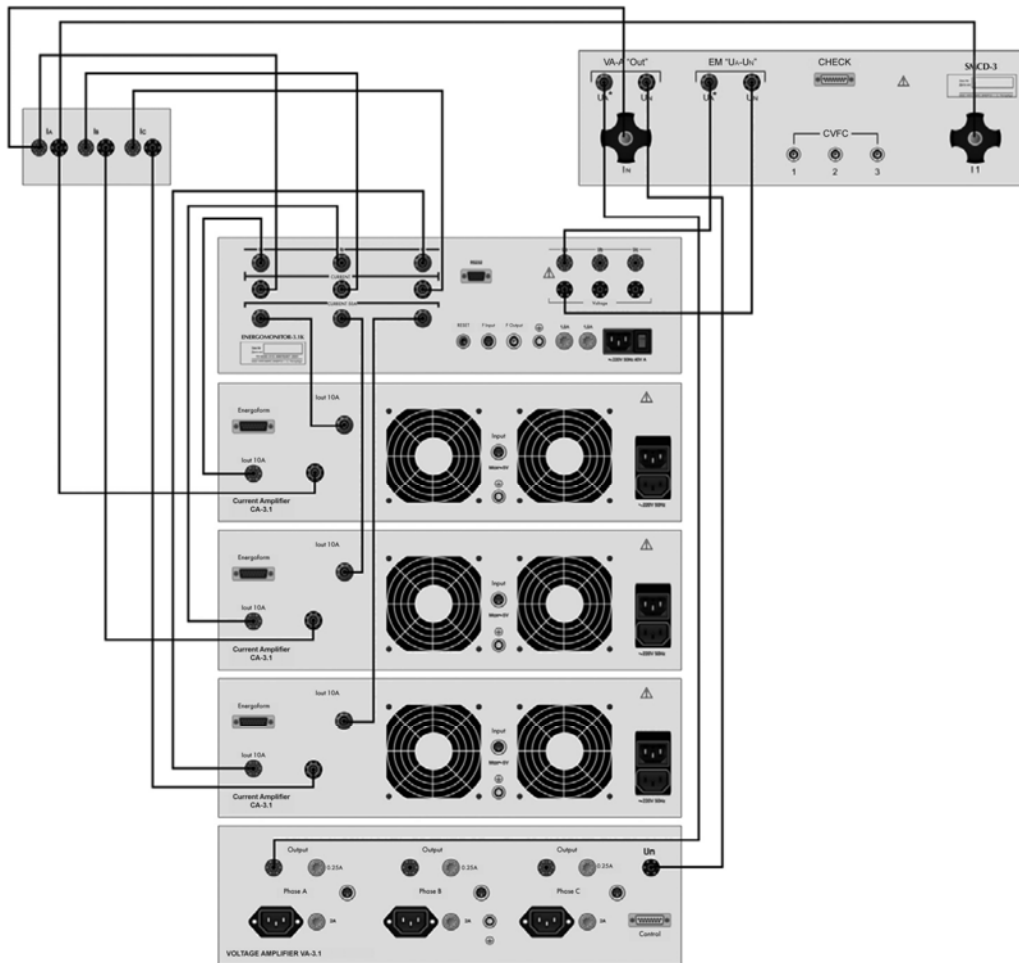


Fig. 1 Connecting SMCD-3 to MTS ME 3.1KM

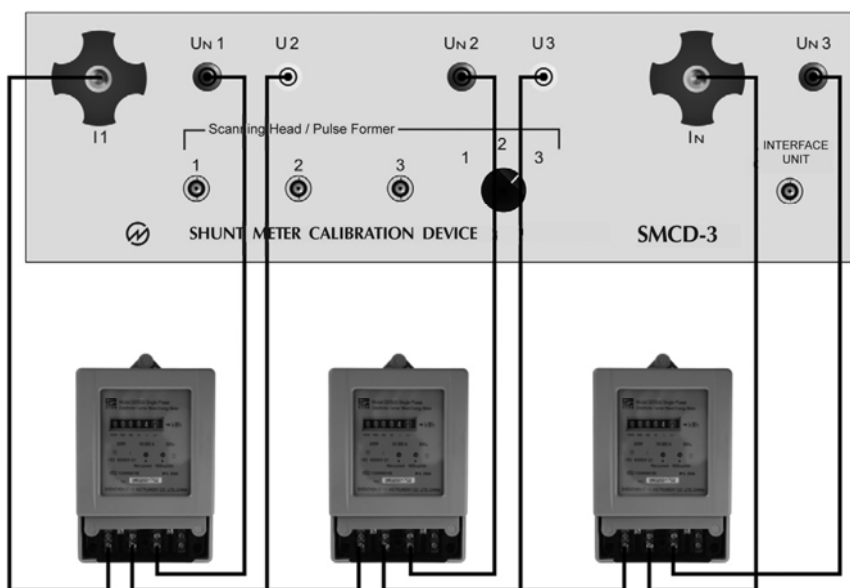


Fig. 2 Connecting meters under test to SMCD-3