

**TTIP**  
**Portable current transformers**

User Manual

Edition 3.2

2015

## Table of contents

<b>INTRODUCTION</b> .....	<b>3</b>
<b>1. SAFETY REQUIREMENTS</b> .....	<b>4</b>
<b>2. GENERAL INFORMATION AND OPERATION PRINCIPLE</b> .....	<b>5</b>
2.1. Purpose and fields of application .....	5
2.2. Operating conditions.....	5
2.3. Scope of supply .....	5
2.4. Specifications .....	5
2.5. Design.....	6
<b>3. OPERATION</b> .....	<b>10</b>
3.1. Operating restrictions .....	10
3.2. Preparing for operation .....	10
3.3. Operation .....	10
<b>4. MAINTENANCE</b> .....	<b>12</b>
<b>5. CALIBRATION</b> .....	<b>12</b>
<b>6. REPAIR</b> .....	<b>12</b>
<b>7. STORAGE AND TRANSPORTATION</b> .....	<b>12</b>
<b>8. MARKING AND SEALING</b> .....	<b>13</b>
<b>9. WARRANTY</b> .....	<b>14</b>
<b>10. PACKING FORM</b> .....	<b>16</b>
<b>11. ACCEPTANCE FORM</b> .....	<b>16</b>
<b>12. WARRANTY CLAIM</b> .....	<b>17</b>
<b>13. CALIBRATION</b> .....	<b>18</b>
<i>APPENDIX A</i> Example connection diagram for the TTIP with 5A secondary applied for testing instrument current transformers .....	<b>19</b>
<i>APPENDIX B</i> Example connection diagram for the CT with 5A secondary used as part of Mars-Energo’s instrument transformer test system.....	<b>20</b>

## INTRODUCTION

This User's Manual (the UM below) covers portable instrument-class current transformers of TTIP series (the CT below) and contains information on their design, preparing for operation, operation principles and other information required for proper operation of the transformers.

With respect to rated primary and secondary currents, the TTIP series current transformers come in 4 modifications:


- TTIP-5000/5
- TTIP-100/5;
- TTIP-5000/5(1)
- TTIP-100/5(1)

## 1. SAFETY REQUIREMENTS

1.1. While the CT is being used as intended, the “Interbranch rules for Labour Safety (Safety Rules) When Operating Electrical Systems”, “Safety requirements for Operation of Electrical Installations on Consumer Side” in the part dedicated to LV installations (circuits below 1000V) and corresponding local electrical safety requirements must be observed.

1.2. While the CT is being calibrated, the safety requirements stated in GOST 8.217–2003 (“State system for ensuring the uniformity of measurements. Current transformers. Verification procedure”) must be observed.

1.3. You must NOT make any connections to the secondary terminals of the CT until you have made sure that voltage is removed from its primary terminals. During operation the secondary terminals of the CT must be short circuited without any possibility to make open circuit on load.

1.4. The CT must be grounded. The ground terminal of the CT (marked as ) must be connected to the grounding bus.

## 2. GENERAL INFORMATION AND OPERATION PRINCIPLE

### 2.1. Purpose and fields of application

The CT is a reference transformer designed for use in AC circuits (up to 0.66 kV, 50 Hz) for testing and calibration of instrument current transformers of 0.2S accuracy class (or less accurate) in the field or laboratory conditions.

### 2.2. Operating conditions

2.2.1. The CT is designed for use in cool temperate climate zones.

The operation atmosphere is non-explosive; without conductive dust or aggressive gases in metal-destroying concentrations present in the air (type II atmosphere according to GOST 15150-69).

2.2.2. Environmental conditions for operation, transportation and storage:

- Lower value of operating temperature .....+1 °C
- Upper value of operating temperature.....+35 °C
- Lower value of transportation and storage temperature.....-50 °C
- Upper value of transportation and storage temperature .....+50 °C
- Relative humidity ..... 30–80 %
- Atmospheric pressure..... 84–106 kPa (630–795 mm Hg)

2.2.3. Operating position: at user's option.

### 2.3. Scope of supply

The scope of supply is represented in Table 1.

Table 1

Name and description	Q-ty
Portable Reference Current Transformer TTIP	1 (2)
Calibration certificate	1
Cable for connection to TTIP secondary terminals	1 (TTIP-5000/5 + TTIP-100/5)
Cable for connection to transformer-under-test secondary terminals	1 (TTIP-5000/5 + TTIP-100/5)
Jumpers (for TTIP-5000/5)	3
User's Manual	1
Package	1

### 2.4. Specifications

2.4.1. Table 2 represents the specifications of TTIP.

Table 2

Parameter	Value			
	TTIP-5000/5	TTIP-100/5	TTIP-5000/5(1)	TTIP-100/5(1)
Accuracy class	0.05			
Rated primary current $I_{1NOM}$ , A	150; 200; 250; 300; 400; 500; 600; 750; 800; 1000; 1200; 1500; 2000; 3000; 4000; 5000	5; 10; 15; 20; 25; 30; 40; 50; 60; 75; 80; 100	150; 200; 250; 300; 400; 500; 600; 750; 800; 1000; 1200; 1500; 2000; 3000; 4000; 5000	5; 10; 15; 20; 25; 30; 40; 50; 60; 75; 80; 100
Rated secondary current $I_{2NOM}$ , A	5		5 and 1	
Rated primary voltage, kV	0.66			
Rated burden (at $\cos \varphi = 1$ ), VA	5		5 at $I_{2NOM} = 5$ A	
			2 at $I_{2NOM} = 1$ A	
Overall dimensions, mm (or less)	360 × 170 × 310		360 × 170 × 310 and 360 × 170 × 310	
Weight, kg (or less)	20			
Mean time to failure (under operating conditions) , hours (or more)	50 000			
Average lifetime, years (or more)	25			

2.4.2. Time of continuous operation: 20 min

Time between operation cycles: 20 min

Test voltage: 3 kV

## 2.5. Design

2.5.1. In both TTIP-5000/5 and TTIP-100/5, there are toroidal cores with primary and secondary windings on the cores enclosed in a metal housing (see Fig. 2.1 and 2.2).



**Fig. 2.1** View of TTIP-5000/5:

1 — Secondary terminals; 2 — Switch for short-circuiting the secondary winding 3 — Hole for passing the primary conductor cable 4 — Grounding terminal

2.5.2. The primary winding cable of the TTIP-5000/5 (see Fig. 2.1) is passed through the side hole. The front panel bears 14 red terminals for connection to the secondary winding, “Measurement/Short-circuit” switch for shorting the secondary, and grounding terminal. The secondary is short-circuited when the switch is in “T” position (S6 and S14 terminals are shorted).



**Fig. 2.2** View of TTIP-100/5

1 — Secondary terminals 2 — Switch for short-circuiting the secondary winding 3 — Primary terminals 4 — Grounding terminals

2.5.3. The front panel of the TTIP-100/5 (Fig. 2.2) bears 9 black terminals for connection to the primary winding, 5 red terminals for connection to the secondary winding, “Measurement/Short-circuit” switch for shorting the secondary, and grounding terminal. The secondary is short-circuited when the switch is in “I” position (S1 and S5 terminals are shorted).

2.5.4. The TTIP-5000/5(1) and TTIP-100/5(1) transformers are rated at 2 currents: 5A and 1A. Structurally each of them is a cascaded set of 2 transformers. The second stage transformer TTIP-5/1 (Fig. 2.3) with 5/1 transformer ratio is connected to the secondary of TTIP-5000/5 or TTIP-100/5 to get an output current of 1A. The front panel of the second stage transformer includes terminals P1 and P2 for primary connection, terminals S1 and S2 for secondary connection, the short-circuit switch and grounding terminal.





**Fig. 2.3** View of TTIP-5/1

1 — Secondary terminals 2 — Primary terminals 3 — Switch for short-circuiting the secondary winding 4 — Grounding terminal

## 3. OPERATION

### 3.1. Operating restrictions

During operation the environmental conditions must comply with the requirements specified in section 2.2.

### 3.2. Preparing for operation

3.2.1. Check that the delivery package contains all items specified in Table 1 and manufacturer's seals are intact. Should anything in the package be found damaged, contact the supplier immediately.

3.2.2. Make sure that the safety requirements specified in Section 1 are met.

3.2.3. If the CT has been transported or stored for 2 hours (or more) under other conditions than the operating conditions specified in Section 2.2, it shall be left to stand for at least 2 hours under the operating conditions before putting into operation.

3.2.4. Before putting into operation, the CT must be grounded through the grounding terminal on its front panel.

3.2.5. The primary conductor cables and cable terminals must be rated for the current passing through the primary winding.

### 3.3. Operation

#### WARNING!

**During operation secondary terminals of the CT must be short-circuited.**

#### 3.3.1. Connecting the CT

Primary and secondary connections are made in accordance with Table 3 — for the TTIP-5000/5, and Table 4 — for the TTIP-100/5.

Appendix A shows an example of connecting the TTIP rated at 5A for calibration of instrument current transformers.

Appendix B shows an example of connecting the TTIP rated at 5A as a component of a typical Mars-Energo's transformer test system for calibration of instrument current transformers.

As regards the TTIP-5000/5(1) and TTIP-100/5(1), to get 1A secondary current, the primary terminals P1 and P2 of the second-stage transformer TTIP-5/1 are connected to the secondary terminals of the TTIP-5000/5 (TTIP-100/5) in accordance with Table 3 (Table 4). The secondary terminals S1 and S2 are connected to the comparator.

Table 3

**Primary and secondary connections of TTIP-5000/5**

<b>Rated primary current, A</b>	<b>Number of primary turns (through P1–P2)</b>	<b>Connections to secondary terminals</b>	<b>Short-circuited secondary terminals</b>
5000	1	S3–S14	S2–S3; S5–S6
4000	1	S6–S14	S1–S3; S2–S4; S4–S6
3000	1	S10–S13	S1–S3; S2–S4; S4–S6
2000	1	S10–S12	S1–S3; S2–S4; S4–S6
1500	1	S12–S14	S1–S3; S2–S4; S4–S6
1200	1	S9–S11	S1–S3; S2–S4; S4–S6
1000	1	S11–S12	S1–S3; S2–S4; S4–S6
800	1	S3–S9	S1–S3; S2–S4; S4–S6
750	1	S3–S8	S1–S3; S2–S4; S4–S6
600	1	S3–S7	S1–S3; S2–S4; S4–S6
600	2	S9–S11	S1–S3; S2–S4; S4–S6
500	1	S1–S2	S1–S3; S2–S4; S4–S6
500	2	S1–S4	S2–S3; S4–S6
400	2	S3–S9	S1–S3; S2–S4; S4–S6
300	2	S3–S7	S1–S3; S2–S4; S4–S6
300	4	S9–S11	S1–S3; S2–S4; S4–S6
250	4	S12–S13	S1–S3; S2–S4; S4–S6
200	4	S3–S9	S1–S3; S2–S4; S4–S6
150	4	S3–S7	S1–S3; S2–S4; S4–S6

Table 4

**Primary and secondary connections of TTIP-100/5**

<b>Rated primary current, A</b>	<b>Connections to primary terminals</b>	<b>Connections to secondary terminals</b>
100	P1–P2	S1–S5
80	P4–P5	S3–S5
75	P4–P5	S4–S5
60	P1–P3	S2–S5
50	P3–P5	S4–S5
40	P1–P4	S3–S5
30	P1–P5	S2–S5
25	P1–P5	S4–S5
20	P1–P6	S3–S5
15	P1–P7	S2–S5
10	P8–P9	S3–S5
5	P1–P9	S3–S5

## **4. MAINTENANCE**

The routine maintenance includes:

- Cleaning the housing and contact surfaces of the CT from dust and dirt
- Visual inspection of the CT for external damages

## **5. CALIBRATION**

Before being shipped to the customer, each CT undergoes primary (post-manufacture) calibration. A period of four calendar years is considered maximum time between calibrations.

## **6. REPAIR**

The faulty CT can be repaired only by the manufacturer. For repairs under warranty, or at any other time, please contact the manufacturer.

## **7. STORAGE AND TRANSPORTATION**

The CT can be transported in any enclosed vehicle. For the environmental conditions during transportation see section 2.2.

## 8. MARKING AND SEALING

8.1. All external inputs/outputs are marked using the technology that provides weather-resistance and durability of the marking.

### **TTIP-5000/5:**

P1, P2 —input and output holes (respectively) for passing the primary winding cable

S1–S14 — secondary terminals

### **TTIP-100/5:**

P1–P9 — primary terminals

S1–S5 — secondary terminals

### **TTIP-5/1** (see section 2.5.4):

P1, P2 — primary terminals

S1, S2 — secondary terminals

8.2. The front panel bears:

- Warning of the presence of high voltage on the opened secondary windings
- Manufacturer's trade mark
- Type of the CT

8.3. The nameplate bears:

- Manufacturer's name
- Product name
- Type
- Serial number
- TS (Technical Specifications) number
- Month and year of manufacture
- Rated primary voltage, V
- Rated primary current, A (or kA)
- Rated secondary current, A
- Accuracy class and corresponding rated burden (VA)
- Time of continuous operation and time between operation cycles, min
- Test voltage, kV
- Weight, kg

8.4. Two seals are installed at the top of the housing.

## 9. WARRANTY

9.1. Transformers of TTIP series are warranted against defects in manufacture or material **for a period of 4 (four) years** from the date of purchase from the manufacturer. The transformer 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 underlisted limitations (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.

### 9.2. 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 CT 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 CT.

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 CT 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 CT 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, such as batteries)
- 4) Damages to the CT caused by:
  - a) Any use other than correct use described in the User's Manual including:
    - Handling of the CT resulting in mechanical damages or other defects including any changes or modifications to the CT
    - Installation or use of the CT 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 CT was used, excluding the other Manufacturer's products intended for use with the CT

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 CT executed by an unauthorized person or company

e) Damages caused by adjustments or modifications made to the CT 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 CT

9.3. 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.*

9.4. 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 CT.

Manufacturer's address (for warranty claims):

**Russia**

**OOO NPP Mars-Energo**

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

### 10. PACKING FORM

Instrument transformer TTIP- \_\_\_\_\_, serial number \_\_\_\_\_

has been packed by the Manufacturer in compliance with the Technical Requirements in force.

Packer signature: \_\_\_\_\_ (*Initials and Name*)

Date: \_\_\_\_\_

### 11. ACCEPTANCE FORM

Instrument transformer TTIP- \_\_\_\_\_, serial number \_\_\_\_\_

has been manufactured in compliance with Technical Specifications TS 4227-039-49976497–2008 and conforms to the Technical Requirements in force.

Head of Quality Control Department: \_\_\_\_\_ (*Initials and Name*)

Corporate Seal:

Date: \_\_\_\_\_

Date of sale: \_\_\_\_\_

(*Corporate Seal*) \_\_\_\_\_ (*Initials and Name*)



## 12. WARRANTY CLAIM

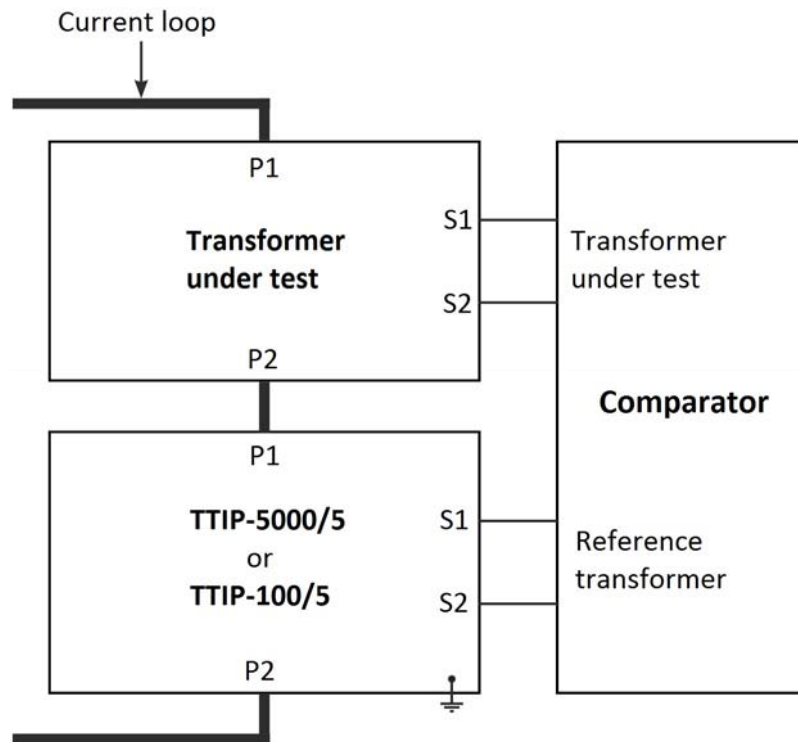
In the event of any failure or defect in manufacture or material during the warranty period (provided that the transportation, storage and operating conditions outlined in this User's Manual are fulfilled), send the CT to the Manufacturer along with the warranty claim containing the following information

- 1) Model and Serial number
- 2) Date of manufacture
- 3) Date of putting the CT into operation
- 4) Condition of the manufacturer's seals (in place, destroyed, absent), see section 8 for the location of the seals
- 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 A

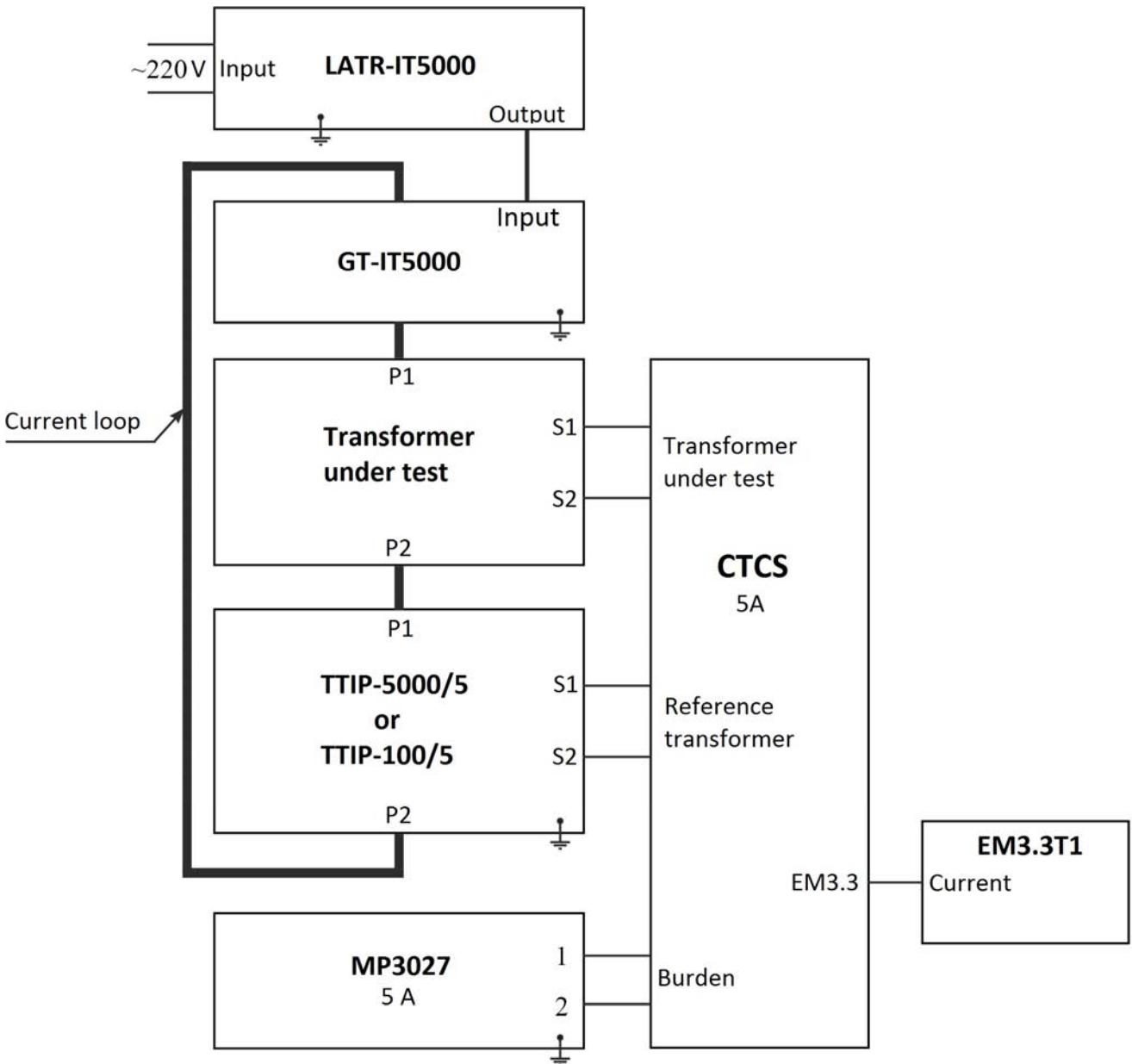
### Example connection diagram for the TTIP with 5A secondary applied for testing instrument current transformers



Primary (P1, P2) and secondary (S1, S2) connections of the TTIP are made in accordance with Table 3 or Table 4.

## APPENDIX B

### Example connection diagram for the CT with 5A secondary used as part of Mars-Energo's instrument transformer test system



- LATR-IT5000** — Variable transformer
- GT-IT5000** — Generating transformer
- CTCS** — Current Transformer Calibration Switch
- EM 3.3** — Comparator Energomonitor 3.3T1
- MP3027** — Burden box

Primary (P1, P2) and secondary (S1, S2) connections of the TTIP are made in accordance with Table 3 or Table 4.