Sets for testing LPITs

In response to the growing need for the equipment capable of testing current or voltage LPITs (Low power instrument transformers), Mars-Energo offers test sets, all based on a duel-channel reference comparator of voltage **MarsComp K-1000** especially designed for this purpose.

Our test sets range from a budget one (no PC control) to the automated setups complete with a PC-controlled source of current or voltage test signals that provide fully automatic control of test process from a PC.

If not only LPITs but also conventional transformers would need to be calibrated with one and the same test system, any of these sets could be complemented with a “traditional” comparator **Energomonitor 3.1KM** (accuracy class 0.05) or **Energomonitor 3.3T1** (accuracy class 0.1).

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MARSENERGO
INSTRUMENTS FOR POWER INDUSTRY

1. Budget set for testing current LPITs

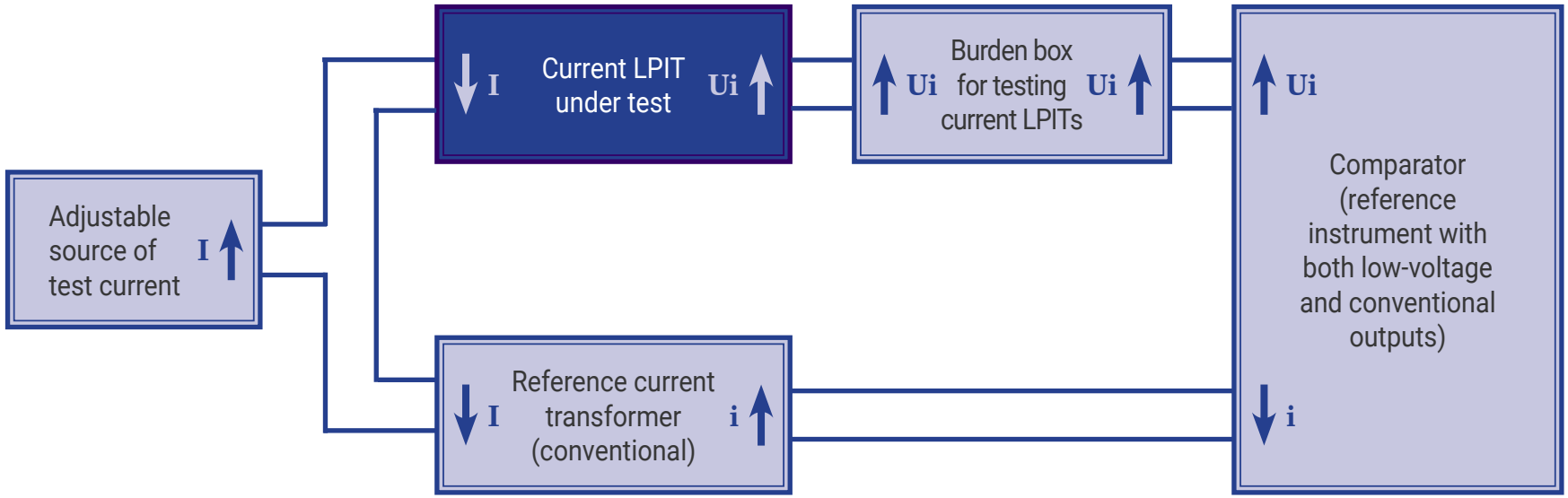
The test set is equipped with a source of test current **IT5000** that does not support a PC control function. Therefore, the set allows LPITS to be tested just in the manual mode.

The **IT5000** current source and the reference transformers of **TTIP** series produced by Mars-Energo can be replaced with either a suitable customer's current source or customer's reference transformers with appropriate characteristics and accuracy.

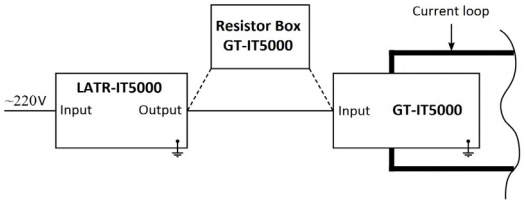
Basic characteristics of current LPITs under test:

Applicable standards	IEC 60044-8, IEC 61869-10
Primary current range	0.05 A to 6000 A
Metering accuracy	IEC class 0.2S (or less accurate)
Low-energy analog outputs	0.5 mV to 9 V

Test scheme



Components

Comparator	Burden box for testing current LPITs	Reference current transformers		Adjustable source of test current	
					
MarsComp K-1000	**Burden box**	**TTIP-100/5** **TTIP-100/5(1)**	**TTIP-5000/5** **TTIP-5000/5(1)**	**IT-5000**	
				Test transformer GT-IT5000	**Variable-ratio transformer LATR-IT5000**
Range					
Measured values **AC voltage (RMS):** 0.2 mV … 840 V **AC current (RMS):** 1 mA … 6 A **Phase angle:** 0 … 90°	**Customer-selectable range of burden setting:** 2 kOhm … 10 MOhm **Customer-selectable burden capacitance:** 33 … 10 000 pF	**Rated primary currents (A):** 5; 10; 15; 20; 25; 30; 40; 50; 60; 75; 80; 100 **Secondary currents:** 1 A, 5 A	**Rated primary currents (A):** 150; 200; 250; 300; 400; 500; 600; 750; 800; 1000; 1200; 1500; 2000; 3000; 4000; 5000 **Secondary currents:** 1 A, 5 A	**Output current setting:** 0.05 … 6000 A	
Key characteristics					
Current ratio error: 0.01% **Phase error:** ±0.5 min **Key function:** LPITs (0.5 mV … 9 V) can be calibrated with conventional reference transformers (1 A, 5 A)		**Accuracy class:** 0.05		I_{NOM} = 5000 A I_{MAX}= 6000 A 	

2. Automated set for testing current LPITs

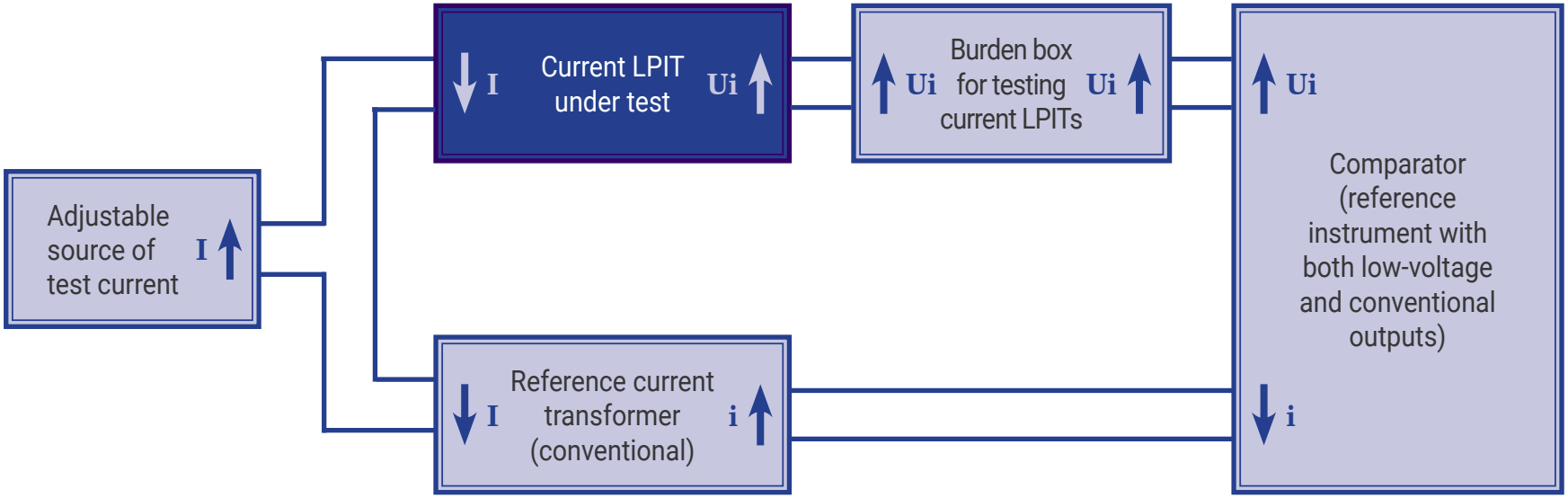
This set will provide max ranging and functionality (available at Mars-Energo) with respect to testing of current LPITs. The source of test current **IT5000A** is PC-controlled, that is why testing can be performed in fully automatic mode.

The reference transformers of **TTIP** series produced by Mars-Energo can be replaced by customer's reference transformers with suitable characteristics and of appropriate accuracy.

Basic characteristics of current LPITs under test:

Applicable standards	IEC 60044-8, IEC 61869-10
Primary current range	0.5 A to 6000 A
Metering accuracy	IEC class 0.2S (or less accurate)
Low-energy analog outputs	0.5 mV to 9 V
Electronic turns ratio	user selectable

Test scheme



Components

Comparator	Burden box for testing current LPITs	Reference current transformers		Adjustable source of test current		Control
						
MarsComp K-1000	**Burden box**	**TTIP-100/5** **TTIP-100/5(1)**	**TTIP-5000/5** **TTIP-5000/5(1)**	**IT-5000A** **Test transformer GT-IT5000A**	**Variable-ratio transformer LATR-IT5000A** (*in development*)	**Personal computer**
Range						
Measured values **AC voltage (RMS):** 0.2 mV … 840 V **AC current (RMS):** 1 mA … 6 A **Phase angle:** 0 … 90°	**Customer-selectable range of burden setting:** 2 kOhm … 10 MOhm **Customer-selectable burden capacitance:** 33 … 10 000 pF	**Rated primary currents (A):** 5; 10; 15; 20; 25; 30; 40; 50; 60; 75; 80; 100 **Secondary currents:** 1 A, 5 A	**Rated primary currents (A):** 150; 200; 250; 300; 400; 500; 600; 750; 800; 1000; 1200; 1500; 2000; 3000; 4000; 5000 **Secondary currents:** 1 A, 5 A	**Output current setting:** 0.5 … 6000 A		
Key characteristics						
Current ratio error: ±0.01 % **Phase error:** ±0.5 min **Key function:** LPITs (0.5 mV … 9 V) can be calibrated with conventional reference transformers (1 A, 5 A)		**Accuracy class:** 0.05		**PC-controlled** **Current setting error:** ±10 % **In increments of:** depending on the current loop selected		Customer selectable

3. Multi-purpose set for testing current transformers (LPITs + Conventional CTs)

To test conventional CTs, set 1 or set 2 for testing current LPITs can be complemented with the units listed below. The burden box (produced by other manufacturer) can be replaced by a customer's burden box with suitable characteristics.

Basic characteristics of conventional CTs under test:

Applicable standards	IEC 61869-2
Primary current range	0.5 A to 6000 A
Metering accuracy	Class 0.2S (or less accurate) with the comparator **EM 3.1KM**
	Class 0.5S (or less accurate) with the comparator **EM 3.3T1**
High-energy analog outputs	1 A, 5 A

Units to be added to sets 1 and 2

Comparator (accuracy class 0.1)		Comparator (accuracy class 0.05)		Burden box
				
Energomonitor 3.3T1 (accuracy class 0.1) *(for testing high-energy analog outputs 1 A, 5 A)*	**Scaling/Commutation unit CTCS-3.3** *(includes scaling converters and a commutation unit)*	**Energomonitor 3.1KM-P-05 (accuracy class 0.05)** *(for testing high-energy analog outputs 1 A, 5 A)*	**Scaling/Commutation unit CTCS-3.1** *(includes scaling converters and a commutation unit)*	**Burden box of conventional type MR 3027** *(for testing high-energy analog outputs 1 A, 5 A)*
Range				
Voltage measurement range: 0.6 … 600 V **Current measurement range:** Depends on the primary current scaling converters, with the Current Transformers Block: 0.0025 … 75 A		**Voltage measurement range:** 0.1 … 960 V **Current measurement range:** 0.005 … 120 A		**For 1 A output:** 1.0 VA … 50 VA (limited number of fixed values) **For 5 A output:** 1.25 VA … 50 VA (limited number of fixed values) Connection of MR 3027 boxes in series is possible
Key characteristics				
Current ratio error: ±0.02% **Phase error:** ±1 min		**Current ratio error:** ±0.002% **Phase error:** ±0.1 min		Burden box of mechanical type Limits of permissible intrinsic error of the burden value (with respect to its nominal) ±4% Rated current 1 A and 5 A Rated power factor (cosφ) = 0.8

4. Automated set for testing voltage LPITs

This set will provide max ranging and functionality (available at Mars-Energo) with respect to the testing of voltage LPITs. Depending on the desired range, the set may include one of the test voltage sources (both PC-controlled): up to 35 kV, or up to 110/√3 kV.

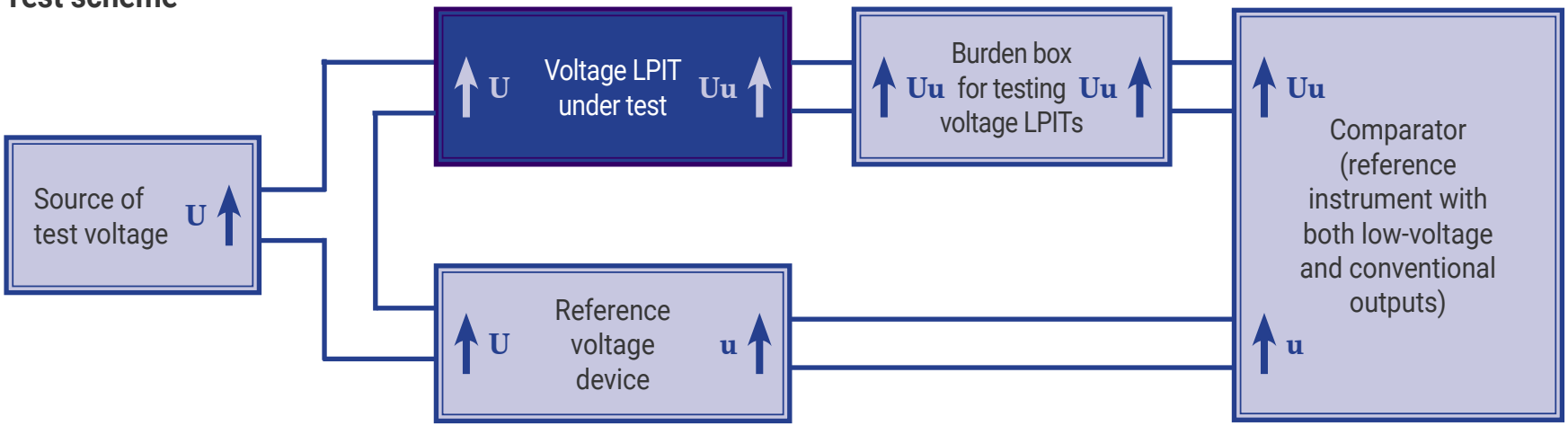
The test voltage source up to 35 kV consists of a test transformer (produced by other manufacturer, replaceable by a customer's one) and a laboratory-type variable-ratio transformer LATR-IT5000A (controlled from a PC).

The HV module for testing VTs 110/√3 kV is produced by other manufacturer, and thus it can be replaced by a customer's one. The primary voltage range can be expanded up to 330/√3 kV (with use of the Mars-Energo's reference voltage transducer CHVT-330 up to 330/√3 kV), however the weight of the corresponding HV module adds up to1450 kg.

Basic characteristics of voltage LPITs under test:

Applicable standards	IEC 60044-7, IEC 61869-11
Primary voltage range	single-phase; up to 35 kV; up to 110/√3 kV (up to 330/√3 kV)
Metering accuracy	Accuracy class 0.5 (or less accurate)
Low-energy analog outputs	0.5 mV to 9 V
Electronic turns ratio	user selectable

Test scheme



Components

Comparator	Burden box for testing voltage LPITs	Reference voltage device	Source of test voltage			Control
			35 kV		110/√3 kV	
						
MarsComp K-1000	**Burden box**	**CHVT-35 or CHVT-110**	**Test (generating) transformer**	**Variable-ratio transformer LATR-IT5000A** (*in development*)	**HV module + Console unit**	**Personal computer**
Range						
Measured values **AC voltage (RMS):** 0.2 mV … 840 V **AC current (RMS):** 1 mA … 6 A **Phase angle:** 0 … 90°	**Customer-selectable range of burden setting:** 2 kOhm … 10 MOhm **Customer-selectable burden capacitance:** 33 … 10 000 pF	**Voltage measurement range:** 40 to 120% of rated voltage	1 … 35 kV	**Range of regulating voltage:** 15 … 250 V	**Range of generated voltages:** 10 … 100 kV	
Key characteristics						
Voltage ratio error: ±0.01 % **Phase error:** ±0.5 min **Key function:** to calibrate LPITs (0.5 mV … 9 V), conventional (100 V, 100/√3 V) reference transformers may be used		**Accuracy classes:** 0.1 or 0.05 **Rated voltage (primary):** 35 kV, 110/√3 kV **Rated voltage (secondary):** 100, 100/√3, 110, 110/√3 V, or user-selectable	**Rated secondary voltage:** 35 kV **Rated primary voltage:** 200 V **Max power generated:** 1500 VA **Power generated in the long-term mode:** 1200 VA	**PC-controlled** **Voltage setting error:** ±3% **In increments of:** 1 to 3 V	**Max power generated:** 7.8 kVA **Power generated in the long-term mode:** 4.1 kVA	Customer selectable

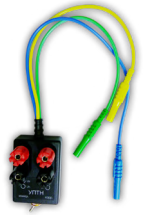
5. Multi-purpose set for testing voltage transformers (LPITs + Conventional VTs)

To test conventional VTs, a set for testing voltage LPITs can be complemented with the units listed below. The burden box (produced by other manufacturer) can be replaced by a customer's burden box with suitable characteristics.

Basic characteristics of conventional VTs under test:

Applicable standards	IEC61869-3
Primary voltage range	up to 35 kV, up to 110√3 kV
Metering accuracy	Class 0.2 (or less accurate) with the comparator **EM 3.1KM** Class 0.5 (or less accurate) with the comparator **EM 3.3T1** (if the reference device has accuracy class 0.05 or better)
Analog outputs	100, 100/√3, 110, 110/√3 V

Units to be added to set 4

Comparator (accuracy class 0.1)		Comparator (accuracy class 0.05)	Burden box
			
Energomonitor 3.3T1 (accuracy class 0.1) *(for testing voltage outputs 100, 100/√3, 110, 110/√3 V)*	**Scaling/Commutation unit VTCS** *(includes scaling converters and a commutation unit)*	**Energomonitor 3.1KM-P-05 (accuracy class 0.05)** *(for testing voltage outputs 100, 100/√3, 110, 110/√3 V)*	**Burden box of conventional type MR 3025** *(for testing voltage outputs 100, 100/√3, 110, 110/√3 V)*
Range			
Voltage measurement range: 0.6 … 600 V **Current measurement range:** Depends on the primary current scaling converters, with the Current Transformers Block: 0.0025 … 75 A		**Voltage measurement range:** 0.1 … 960 V **Current measurement range:** 0.005 … 120 A	**Nominal values of AC voltage applied to the burden box:** - 100 V for the Burden box 100 V–80 VA - 57 V (100/√3 V) for the Burden box 57 V–80 VA
Key characteristics			
Current ratio error: ±0.02% **Phase error:** ±1 min		**Current ratio error:** ±0.002% **Phase error:** ±0.1 min	Burden box of mechanical type Limits of permissible intrinsic error of the burden value (with respect to its nominal) ±4% Rated power factor (cosφ) = 0.8