

# SYSTEMS AND COMPONENTS FOR TRANSFORMER TESTING

- Type tests
- Routine tests
- Special tests
- Applicable for tests on power and distribution transformers in factory and on-site



# DISTRIBUTION TRANSFORMERS



Fig. 1 Test system for routine tests on distribution transformers (left: test voltage source type MWV, right: disconnector lifting platform)

## APPLICATION

Distribution transformers in the power range of a few kVA and up to 5 MVA are the essential connecting links between medium and low voltage networks. They are produced in high quantities and test bays are requested to provide a high throughput with high testing quality.

HIGHVOLT's test facility based on a static frequency converter with state-of-the-art DSP control is made to master these challenges. Once the distribution transformer is connected to the terminals, all different test circuits will be switched by disconnectors very quickly. Complete sequences of tests run fully automated, controlled by the HiCOS Advanced MS control system.

## FACTS IN BRIEF

- Testing of distribution transformers 10 kVA...5 MVA
- Only one connection for multiple tests:
  - Applied voltage tests HV and LV
  - Induced voltage tests
  - No-load loss and current measurements
  - Impedance voltage and load loss measurements
  - Temperature rise tests
- Fully automated disconnector control for test circuit changeover without manual interaction
- High efficient control system HiCOS Advanced MS
- Intuitive operator guidance with TFT operator display and HiCOS Basic MS

## SYSTEM AND COMPONENTS

Transformers	Test system		
	Component	Parameters	Type
10 kVA...2.5 MVA	Test voltage source	80 kW/250 kVA/4.8 kV	MWV 80-250/4.8
10 kVA...5 MVA	Test voltage source	170 kW/500 kVA/4.8 kV	MWV 170-500/4.8
all	Applied voltage extension	40 kVA/100 kV	WP 40/100
		6 kVA/100 kV	WP 6/100
	Disconnector setup	4.8 kV/100 kV/1000 A	TPF 1000/100
		4.8 kV/100 kV/3000 A	TPF 3000/100
	Loss measuring system	4.8 kV/1000 A	LiMOS MS 1000/3-3
	Turns ratio and winding resistance measurement	100 V/1 A and 50 V/50 A	ATOS 50
	Insulation tester	5 kV	MIT 525
Temperature data acquisition device	PT100, 10 Channels	TIDAS 32	

For more details please refer to our brochures and datasheets.

# SMALL POWER TRANSFORMERS



Fig. 2 Test system for small power transformers (left: test voltage source [SFC] in 20 ft container, right: loss measuring system LiMOS MS)

## APPLICATION

Small power transformers in the power range of 5 MVA and up to 40 MVA are used to connect medium and high voltage networks. They are often produced by growing distribution transformer manufacturers aiming to expand into the power transformer market. Testing must meet the needs of both types of transformers such as low and medium test voltages at moderate throughput and power requirements.

HIGHVOLT applies a powerful static frequency converter with a well adapted step-up transformer and compensation unit. The versatile HiCOS Advanced MS control system enables user-friendly operation of the test system and quick report generation.

## FACTS IN BRIEF

- Testing of small power transformers 5 MVA...40 MVA
- Testing of distribution transformers up to 5 MVA
- Only one air-cooled static frequency converter as central test power source for all tests
- Well adapted step-up transformer and HV compensation unit
- Optional disconnecter system for testing of distribution transformers with fully automated control for test circuit changeover without manual interaction
- High efficient control system HiCOS Advanced MS
- Intuitive operator guidance with TFT operator display and HiCOS Basic MS

## SYSTEM AND COMPONENTS

Transformers	Test system		
	Component	Parameters	Type
5 MVA...20 MVA	Test system	325 kW/325 kVA/40 kV	WV 325-325/40
5 MVA...30 MVA	Test system	325 kW/540 kVA/40 kV	WV 325-540/40
5 MVA...40 MVA	Test system	540 kW/540 kVA/40 kV	WV 540-540/40
all	Applied voltage extension	40 kVA/150 kV	WP 40/150
		40 kVA/200 kV	WP 40/200
	Loss measuring system	10 kV/1000 A	LIMOS MS 1000/10-3
		24 kV/1000 A	LiMOS MS 1000/24-3
		46 kV/1000 A	LIMOS MS 1000/46-3
	HV compensation unit	12 kV/5.5 Mvar	HVCC 5500/12
		12 kV/9.7 Mvar	HVCC 9700/12
		24 kV/13 Mvar	HVCC 13000/24
	Turns ratio and winding resistance measurement	100 V/1 A and 50 V/50 A	ATOS 50
	Insulation tester	5 kV	MIT 525
Temperature data acquisition device	PT100, 10 Channels	TIDAS 32	

For more details please refer to our brochures and datasheets.

# MEDIUM POWER TRANSFORMERS



Fig. 3 Test system for medium power transformers (left: test voltage source 1 MW/2 MVA [SFC] in 40 ft container, right: test system 620kW/1MVA + HVCC)

## APPLICATION

Medium power transformers in the power range of 40 MVA and up to 200 MVA are often used as step-up transformers for generators and networks such as in on-shore and off-shore windparks. They are the day-to-day business for power transformer manufacturers. The test equipment for these units must be easily configurable for quick and reliable testing. The heart of the test equipment is a static frequency converter as the one and only test voltage source with an output power of up to 3 MVA. A tuned step-up transformer with more than 40 steps, a well adapted HV compensation unit, HIGHVOLT's loss measuring system LiMOS HS and the HiCOS Advanced control system are further key components for successful testing.

## FACTS IN BRIEF

- Testing of medium power transformers 40 MVA...200 MVA
- One powerful static frequency converter built into a 40 ft container as central test power source for all tests
- Step-up transformer with more than 40 steps for best voltage and test power adaptation
- Manually or pneumatically configurable HV capacitive compensation unit with advanced unbalance protection.
- Loss measuring system LiMOS HS with the world's highest accuracy and fiber optic, interference-free data transmission
- High efficient control system HiCOS Advanced with database and easy report generation

## SYSTEM AND COMPONENTS

Transformers	Test system		
	Component	Parameters	Type
40 MVA...60 MVA	Test system	620 kW/1000 kVA/80 kV	WV 620-1000/80
40 MVA...100 MVA	Test system	1000 kW/2000 kVA/80 kV	WV 1000-2000/80
40 MVA...200 MVA	Test system	1500 kW/3000 kVA/80 kV	WV 1500-3000/80
all	Step-up transformer	1000 kVA/80 kV/12 steps	FPDO 1000/80
		3000 kVA/80 kV/42 steps	FPDO 3000/80
	Loss measuring system	100 kV/2000 A	LiMOS 2000/100-3
		100 kV/4000 A	LiMOS 4000/100-3
	HV compensation unit	36 kV/54 Mvar	HVCC 54000/36
		42 kV/54 Mvar/pneumatic	Auto-HVCC 54000/42
		54 kV/75 Mvar	HVCC 75000/54
		72 kV/110 Mvar	HVCC 110000/72
	Turns ratio and winding resistance measurement	100 V/1 A and 50 V/50 A	ATOS 50
	Insulation tester	5 kV	MIT 525
Temperature data acquisition device	PT100, 10 Channels	TIDAS 32	

For more details please refer to our brochures and datasheets.



# LARGE POWER TRANSFORMERS



Fig. 4 Test system for large power transformers (left: 2 MW 4 MVA [SFC], step-up transformer and filters, right: loss measuring system LiMOS 2000/100-3)

## APPLICATION

Large power transformers in the power range of 200 MVA and up to 1500 MVA are used as generator step-up transformers (GSU), as step-down and system interconnecting transformers. They are the backbone of every power station and belong to the most important as well as most expensive asset of any utility. The testing requires very high test power and voltage. HIGHVOLT uses its ready-to-go 40 ft container design to bring an almost totally assembled and pre-tested static frequency converter to the customer site. The test systems are completed by well adapted step-up transformers and capacitor banks and the necessary measuring and control systems. In case of very high test power requirements two or more containers can be operated in parallel.

## FACTS IN BRIEF

- Testing of large power transformers 200 MVA...1500 MVA
- One single or parallel connected powerful static frequency converters as central test power source
- Step-up transformer with more than 40 steps for best voltage and test power adaptation
- Manually or pneumatically configurable HV capacitive compensation unit with advanced unbalance protection
- Loss measuring system LiMOS HS with the world's highest accuracy and fiber optic, interference-free data transmission
- High efficient control system HiCOS Advanced with database and easy report generation

## SYSTEM AND COMPONENTS

Transformers	Test system		
	Component	Parameters	Type
200 MVA...400 MVA	Test system	1500 kW/3000 kVA/170 kV	WV 1500-3000/170
200 MVA...630 MVA	Test system	2000 kW/4000 kVA/170 kV	WV 2000-4000/170
200 MVA...1000 MVA	Test system (2 container)	4000 kW/8000 kVA/200 kV	WV 4000-8000/200
200 MVA...1500 MVA	Test system (3 container)	6000 kW/12000 kVA/200 kV	WV 6000-12000/200
all	Step-up transformer	4000 kVA/170 kV/52 steps	FPDO 4000/170
		4000 kVA/200 kV/52 steps	FPDO 4000/200
	Loss measuring system	200 kV/2000 A	LiMOS 2000/200-3
		200 kV/4000 A	LiMOS 4000/200-3
	HV compensation unit	72 kV/132 Mvar	HVCC 1320000/72
		90 kV/190 Mvar	HVCC 190000/90
		100 kV/200 Mvar/pneumatic	Auto-HVCC 200000/100
		100 kV/400 Mvar/pneumatic	Auto-HVCC 400000/100
	Turns ratio and winding resistance measurement	100 V/1 A and 50 V/50 A	ATOS 50
	Insulation tester	5 kV	MIT 525
Temperature data acquisition device	PT100, 10 Channels	TIDAS 32	

For more details please refer to our brochures and datasheets.

# ON-SITE TESTING OF TRANSFORMERS



Fig. 4 Test system for on-site tests on transformers (left: WV 620-1000/80, right: extension for applied voltage tests WRV 5/360 M)

## APPLICATION

On-site tests of power transformers are an essential part of the lifecycle and maintenance management of utilities. Especially after transportation, installation and repair or for maintenance, these tests provide information on the dielectric condition and the reliability of transformers before energizing in the grid. HIGHVOLT's all-in-one mobile transformer test system based on a static frequency converter enables a very quick condition assessment of power transformers in substations and power plants. The basic system is designed for induced, no-load and applied voltage tests. With the optional mobile HV capacitive compensation unit even load loss and temperature rise tests can be performed on-site. All necessary equipment such as loss and PD measuring system as well as all feeding and testing cables are on board. The HiCOS Advanced control system can be operated from the air-conditioned control room.

## FACTS IN BRIEF

- On-site diagnostic on large and medium power transformers
- Complete test system built into a 40 ft container
- Step-up transformer with 12 steps
- Rugged design for frequent transportation on the road
- Extendable with mobile HV capacitive compensation unit for load loss and temperature rise tests
- On board advanced loss measuring system LiMOS MS and PIDAS® MPD 600 PD measuring system with interference-free fiber optic data transmission
- High efficient test software HiCOS Advanced with database and easy report generation
- Parallel connection of up to three on-site test systems for testing of very large power transformers on-site

## SYSTEM AND COMPONENTS

Transformers	Test system		
	Component	Parameters	Type
40 MVA–60 MVA	Test system	620 kW/1000 kVA/80 kV	WV 620-1000/80
100 MVA	Capacitive compensation unit	24000 kVA/36 kV	HVCC 24000/36
500 MVA	Applied voltage test extension	3200 kV/320 kV	WRV 5/360
all	Turns ratio and winding resistance measurement	100 V/1 A and 50 V/50 A	ATOS 50
	Insulation tester	5 kV	MIT 525
	Temperature data acquisition device	PT 100, 10 Channels	TiDAS 32

For further information please contact:

**HIGHVOLT Prüftechnik Dresden GmbH**  
 Marie-Curie-Straße 10  
 01139 Dresden  
 Germany

Phone +49 351 8425-700  
 Fax +49 351 8425-679  
 E-mail sales@highvolt.de  
 Web www.highvolt.de