Below diagram gives a first orientation about the solutions made by HIGHVOLT, applicable for different tests and transformer sizes.

					Max. power of test object: Temperature rise test (MVA)	Load loss test (MVA)	No-load loss test (MVA)	Voltage levels: Highest voltage for equipment winding (U_m in kV)	Induced voltage test (U in kV)	Applied voltage test (U in kV)	Impulse test (U in kV) LI / LIC / SI
	WV 1500-3000/170	WV 2000-4000/170	WV 4000-8000/200	WV 6000-12000/200	400...1800	900...2000	630...2000	≤ 420...≤ 800	≤ 170...≤ 200	≥ 510	≤ 1425...≤ 2100 / ≤ 1290...≤ 2310 / ≤ 950...≤ 1700
WV 1000-2000/80	WV 1500-3000/80				70...380	230...630	230...630	≤ 362...≤ 420	≤ 80	≤ 460...≤ 630	≤ 1050...≤ 1425 / ≤ 1155...≤ 1570 / ≤ 850...≤ 1175
					15...40	75...170	20...40	≤ 100...≤ 170	≤ 40	≤ 185...≤ 325	≤ 450...≤ 750 / ≤ 495...≤ 820 / ≤ 375...≤ 620
					2.5...5	2.5...5	2.5...5	≤ 52	≤ 3.7...≤ 4.8	≤ 95	≤ 250 / ≤ 275 / n. a.
1000	1500	2000	4000	6000							
2000	3000	4000	8000	12000							
–	–	14	14	28							
54	132	200	400	600							
2 x DERI 1600/250	2 x DERI 3200/300	2 x DERI 3200/350	2 x DERI 3200/400	3 x DERI 3200/350							
IP...G	IP...G	IP...G	IP...G	IP...G							

For further information about our AC and impulse test systems, please refer to our datasheets:
1.10 (AC-test systems)
1.12-1 (metal tank transformers type PEO)
1.21 (tunable modular reactors, type DERI)
3.12 (Impulse voltage generators IP…G)
3.13 (Impulse voltage generators IP...M)

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
- Tapped 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	S1-568
	Temperature data acquisition device	PT 100, 10 Channels	TiDAS 32-10

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HIGH VOLT
Test with the best.®

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

TRANSFORMER TEST SYSTEMS MADE BY HIGHVOLT

FACTS IN BRIEF

The product portfolio by HIGHVOLT covers all dielectric routine-, type- and special tests in accordance to the relevant IEC 60076 and ANSI IEEE C57.12 standards. The range of test objects varies from distribution transformers to the largest power units.

Transformers to be tested	Product portfolio of HIGHVOLT Prüftechnik Dresden GmbH					
LARGE POWER TRANSFORMERS						
MEDIUM POWER TRANSFORMERS						WV 620-1000/80
SMALL POWER TRANSFORMERS			WV 325-325/40	WV 370-540/40	WV 540-540/40	
DISTRIBUTION TRANSFORMERS	DiTAS 80-250/3.7	DiTAS 170-500/4.8				
Related system power						
Active power SFC [kW]	80	170	325	370	540	620
Apparent power SFC [kVA]	80	170	325	540	540	1000
Recommended compensation power						
Compensation – reactive [Mvar]	–	–	–	–	–	–
Compensation – capacitive [Mvar]	0.25	0.5	5.5	9.7	13	24
Possible extensions for applied voltage tests*						
Extensions for applied voltage tests	T 100	PEO 40/100	PEO 300/300	DERI 1000/400	DERI 1000/400	2 x DERI 1000/250
Possible systems for impulse voltage tests*						
Systems for impulse tests	IP...M	IP...M	IP...G	IP...G	IP...G	IP...G

Tab. 1 **HIGHVOLT product range of systems for transformer testing**

* Please note that the shown systems are only a rough estimation; the exact system size needs to be determined by HIGHVOLT based on the parameters of the test object(s)

DISTRIBUTION TRANSFORMERS

Fig. 1 **Test system for type- and routine tests on distribution transformers (left: test voltage source and control system, right: automatic switching system)**

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	DITAS 80-250/4.9
10 kVA...5 MVA	Test voltage source	170 kW/500 kVA/4.8 kV	DITAS 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	S1-568
	Temperature data acquisition device	PT100, 10 Channels	TIDAS 32-10

For more details please refer to our brochures and datasheets.

SMALL POWER TRANSFORMERS

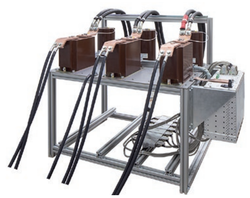

Fig. 2 **Test system for small power transformers (left: test voltage source [SFC] in 20 ft container, right: loss measuring system LiMOS MS)**

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 tapped 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 tapped transformer and HV compensation unit
- Optional disconnector 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	S1-568
	Temperature data acquisition device	PT100, 10 Channels	TIDAS 32-10

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 tapped 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 tapped 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
- Tapped 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	Tapped 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	S1-568
	Temperature data acquisition device	PT100, 10 Channels	TIDAS 32-10

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], tapped 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 tapped 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 tapped 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
- Tapped 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	Tapped 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 132000/72
		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	S1-568
	Temperature data acquisition device	PT100, 10 Channels	TIDAS 32-10

For more details please refer to our brochures and datasheets.