

# MODULAR HVDC TEST SYSTEM

- DC voltage tests on components for HVDC transmission:
  - Cables
  - Transformers
  - Bushings
  - Thyristor valves

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Fig. 1 Modular HVDC test system, type GPM 40/400



Fig. 2 Modular HVDC test system, type GPM 30/800

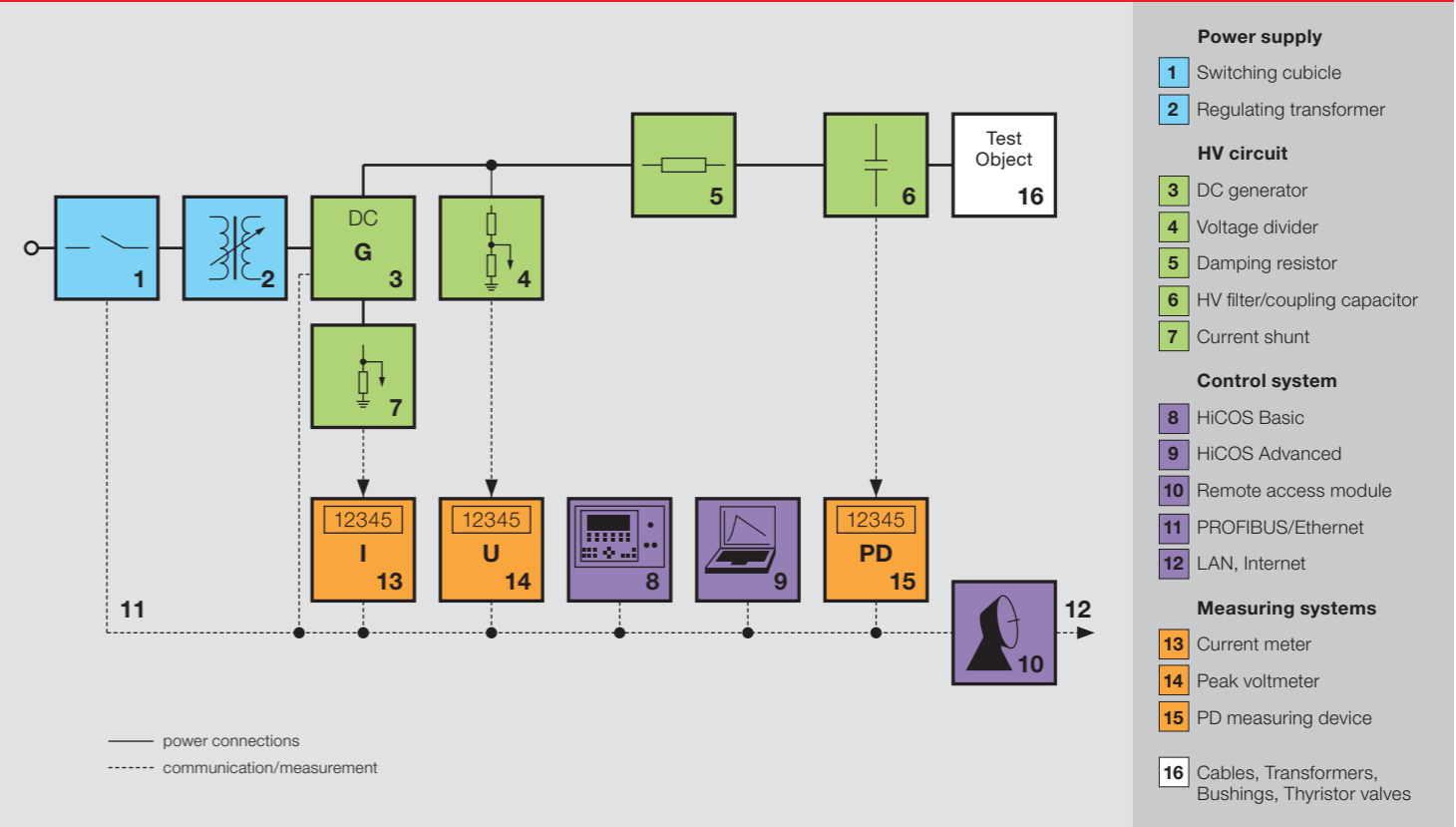


Fig. 3 Block diagram of a modular HVDC test system

## FACTS IN BRIEF

HVDC modules are applied to generate high-voltage direct voltage for routine, type, and development tests on components used in HVDC transmission systems. Some HVDC modules can be easily combined in series operation to attain a higher DC test voltage. The modules are suitable for indoor operation in high-voltage test bays, either in stationary applications or mobile applications using a system of air cushions.

The modular HVDC test system is available for indoor or on-site application.

The test system is designed to generate HVDC test voltages according to IEC 60060-1 (2010-09). The voltage measurement fulfills the requirements according to IEC 60060-2 (2010-11).

The modular HVDC test system allows polarity reversal tests according to relevant standards. This system features a reliable electrical and robust mechanical design. The state-of-the-art control system supports the operator during automatic test procedures.

The following features are available to meet the customer's requirements:

- Internal voltage divider that is part of the DC module
- Air-cushions for easy positioning
- High-voltage filter/coupling capacitor for PD measurement

## BENEFITS

- LOW PD-LEVEL
- LOW RIPPLE (< 3 % ACC. TO IEC)
- INTERNAL VOLTAGE DIVIDER TO SAVE SPACE
- SAVES TIME THANKS TO FAST POLARITY REVERSAL TESTS

- EASY TRANSPORTATION ON STANDARD TRAILERS
- MODULAR DESIGN FOR SIMPLE EXTENSION TO HIGHER VOLTAGES
- FULFILLS LATEST SAFETY REQUIREMENTS FOR PERSONNEL

## APPLICATION

HIGHVOLT offers modular HVDC test systems with a rated current from 10 mA to 40 mA and rated voltage up to 1600 kV that are adapted to the following test applications.

Main applications for HVDC test systems are:

- Factory and on-site testing on HVDC cables according to CIGRÉ 496
- Factory and on-site testing of converter transformers according to IEC 61378-2
- Testing on DC bushings according to IEC 62199
- Research, development, and education

- MAINTENANCE-FREE
- LOW LIFECYCLE COSTS
- SAVES TIME THANKS TO AUTOMATIC TESTING PROCEDURES

## SYSTEM AND COMPONENTS

The HVDC test system is supplied with power via a switching cubicle (1) [see fig. 3]. The regulating transformer (2) adjusts the generated test voltage and feeds the DC generator (3) with the appropriate level of high voltage.

The DC generator together with its rectifiers and capacitors generates the DC test voltage by means of an appropriate electric circuit. For higher test voltages several stackable modules can be cascaded within the DC generator.

An internal resistive voltage divider (3) and a peak voltmeter (14) make up the voltage measuring system. A current shunt (7) and a current meter (13) are used to display the DC test current. The test object is connected via an external damping resistor (5). This damping resistor protects the DC generator against transient overvoltage occurring following a potential breakdown of the test object.

The control system HiCOS is available in order to control the modular HVDC test system and to record, manage, evaluate, and report the measuring data.

HiCOS Basic (8) contains all modules required to control the modular HVDC test system. It consists of HiCO Basic (hardware) and iCOS Basic (software), in addition to the safety measures and housing.

HiCOS Advanced (9) adds a computer control to HiCOS Basic. It consists of HiCO Advanced (hardware) and iCOS Advanced (software), in addition to the safety measures and the housing. HiCOS Advanced can also be connected to the user's LAN and via the INTERNET (12) to HIGHVOLT Customer Service for technical support, software updates, and any other assistance. Furthermore, the modular design of the HiCOS control system allows additional expansions of the range of functions.

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## TECHNICAL PARAMETERS

The modular DC test system is designed to generate HVDC test voltages according to IEC 60060-1 (2010-09). The voltage measurement fulfills the requirements according to IEC 60060-2 (2010-11). The test system [see *figs. 1* and *2*] is applied to withstand or polarity reversal tests on components for HVDC transmission. For technical parameters of standard modular HVDC test systems, see *tables 1* and *2*.

Table 1 **Standard modular HVDC test systems**

Test System	Rated current* [mA]	Rated voltage [kV]	Rated power [kW]	Ripple [%]
GPM 40/400	40	400	16	<3
GPM 30/800	30	800	24	<3
GPM 20/1200	20	1200	24	<3
GPM 10/1600	10	1600	16	<3

Note: The rated values refer to continuous operation. Test systems can also be overloaded for short periods of time.

Table 2 **Operating conditions of standard modular HVDC test system**

Frequency	50/60 Hz
Temperature range	5...40 °C
Daily mean temperature	≤30 °C
Relative humidity	≤90 %
Altitude above sea level	≤1000 m
Duty cycle	continuous

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