HIGH VOLT

Test with the best.®

AC RESONANT TEST SYSTEM FOR ON-SITE TESTING OF GIS/GIL

- AC withstand test
- PD diagnostics

8.04/4 Types WRVG G & WRV M

AC RESONANT TEST SYSTEM FOR GIS/GIL

Fig. 1 **AC resonant test system type WRVG G for on-site testing of GIS/GIL**

Fig. 2 **AC resonant test system type WRV M for on-site testing of GIS/GIL**

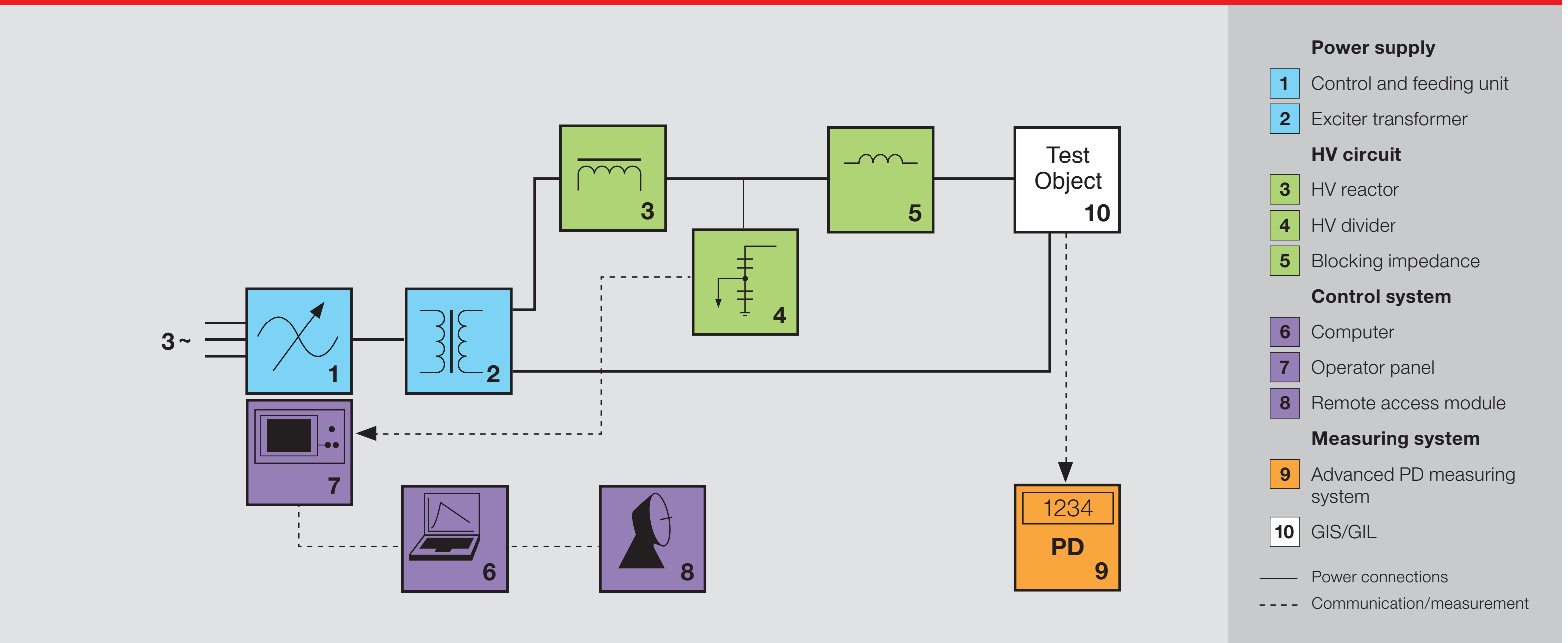

Fig. 3 **Block diagram of AC resonant test system for on-site testing of GIS/GIL**

FACTS IN BRIEF

The test system is able to perform tests on GIS/GIL (gas-insulated switchgear/line) according to IEC 60694, 62271-203, and 60060-3 once they have been installed.
These standards require testing with AC voltage in the frequency range f_{min} = 20 Hz to f_{max} = 300 Hz.

Test system and test object form a series resonant circuit that guarantees a pure sinusoidal waveform of the test voltage due to physics. In case of failure, only minimal damage may occur due to the limited amount of energy stored in the test circuit.

Generally the test system can be set up on-site within a short period of time. There is no need for special “lifting” or “assembly”. A standard three-phase diesel generator can be used for the feeding of the test system.

The test system type WRVG G with an SF_6-insulated reactor can be used for tests on load capacitances up to 10 nF and duty cycles up to 15 minutes per day at rated parameters. This test system can be directly flanged to the test object. The test system is fully shielded and, due to its metal cladding, it has a very compact form and is extremely space-saving. Therefore maintaining a safety distance is no longer required. The special design concept provides the high sensitivity for PD measurements, including measurements for shielding and noise cancellation.

The test system type WRV M with an oil-insulated reactor is used for tests on higher load capacitances and longer duty cycles. To apply the test voltage the test object has to be equipped with an SF_6-to-air bushing. The modular design allows two reactors to be connected in series or parallel to enable testing with higher voltages or power requirements.

APPLICATION

The main application of the AC resonant test system is the AC withstand testing once the GIS/GIL has been installed. These tests will be repeated after repair or maintenance work is carried out on the GIS/GIL.

The tests can be combined with sensitive PD diagnostics that allow detection and localization of defects inside the GIS/GIL.

SYSTEM AND COMPONENTS

The control and feeding unit (1) [see *fig. 3*] consists of a static power inverter and a control system. The power inverter converts the three-phase input voltage into a single-phase output voltage with a rectangular waveform.

The frequency is automatically adapted exactly to the resonant frequency of the HV series resonant circuit formed by the resonant reactor (3) and the GIS/GIL to be tested. The test voltage is regulated by the inverter output voltage and measured by a calibrated measuring system consisting of a peak voltmeter and voltage measuring divider (4).

The exciter transformer (2) isolates the inverter from the test circuit and increases the inverter output voltage, depending on the required test voltage and losses of the HV series resonant circuit. In case of a failure in the GIS/GIL to be tested, high transient voltages can be generated in the HV circuit. The blocking impedance (5) protects the reactor against such transient overvoltage.

The test system can be conveniently controlled by a PLC and an operator panel (7) implemented in the control and feeding unit (1). Optionally, a connected computer (6) allows the operator to comfortably perform complex testing and data recording. Sensitive PD measurements on the GIS/GIL can be performed by means of an advanced PD measuring system (9).

BENEFITS

- PURE SINUSOIDAL WAVEFORM
- FREQUENCY RANGE 20 TO 300 Hz
- EASY AND FAST SETUP
- LOW LOSSES
- LOW NOISE EMISSION
- MAINTENANCE-FREE

TEST SYSTEM TYPE WRVG G

- DIRECTLY FLANGED TO TEST OBJECT
- FULLY SHIELDED
- PD NOISE LEVEL < 2 pC
- COMPACT DESIGN, LOW WEIGHT

TEST SYSTEM TYPE WRV M

- POWERFUL
- LONG DUTY CYCLES
- PD NOISE LEVEL < 10 pC
- SERIES AND PARALLEL OPERATION OF TWO TEST SYSTEMS

AC RESONANT TEST SYSTEM FOR GIS/GIL

TECHNICAL PARAMETERS

Test systems type WRVG G with SF_6-insulated reactors are available up to 680 kV and 1.5 A. These test systems have a duty cycle of up to 15 minutes ON per day at rated parameters [see *table 1*].

Test systems type WRV M with oil-insulated reactors allow a maximum test voltage of up to 800 kV. For test voltages higher than 400 kV, two reactors have to be switched in series. For output current higher than 9 A, two reactors have to be switched in parallel. The duty cycle of such a system is illustrated in *table 1*. Tests on short GIS/GIL corresponding to a low capacitance value will be done at high frequencies up to 300 Hz and on long GIS/GIL corresponding to a high capacitance value at low frequencies down to 20 Hz [see *fig. 4, fig. 6*]. Typically the frequency range will be between 100 Hz and 200 Hz as this allows testing with voltage and current transformers. The load range of a test system is determined by the inductance, design frequency, rated voltage and current of the reactor. The full voltage can be generated between the design frequency and 300 Hz. Below the design frequency, the output voltage is reduced [see *fig. 5, fig. 7*].

Table 1 **Standard test systems**

Insulating medium	With SF_6-insulated reactor		With oil-insulated reactor		
Test system	**WRVG 1.5/460 G**	**WRVG 1.5/680 G**	**WRV 3/350 M**	**WRV 9/700 M**	**WRV 7.5/800 M**
Rated voltage	460 kV	680 kV	350 kV	700 kV	800 kV
Rated current	1.5 A	1.5 A	3 A	9 A	7.5 A
Duty cycle at rated current	15 min ON per day	15 min ON per day	1 hr ON – 1 hr OFF; 3 times a day	1 hr ON – 3 hr OFF; 3 times a day	1 hr ON – 3 hr OFF; 3 times a day

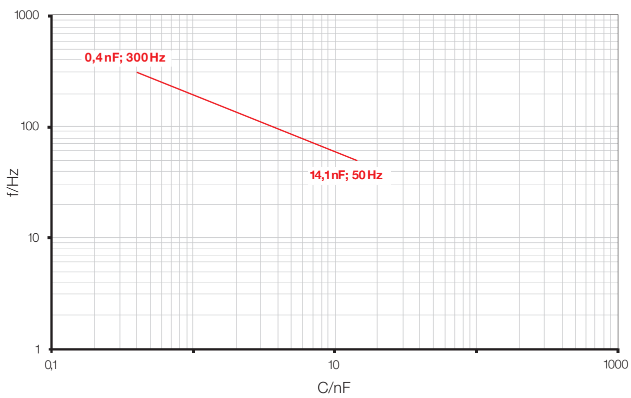

Fig. 4 **Test frequency depending on total load capacitance (example WRVG 1.5/680 G)**

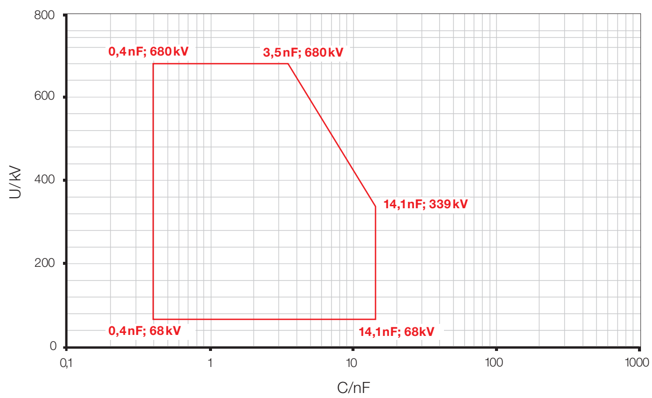

Fig. 5 **Operating range of test system (example WRVG 1.5/680 G)**

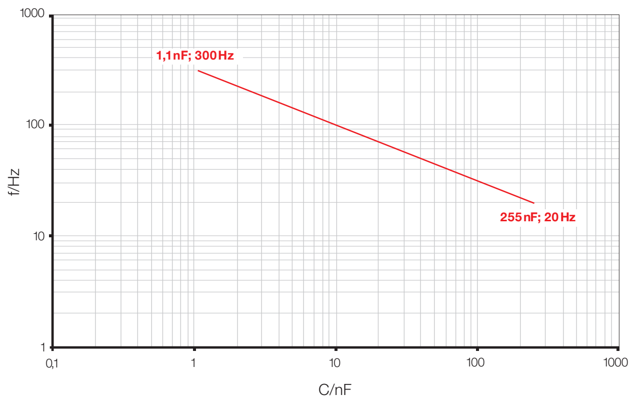

Fig. 6 **Test frequency depending on total load capacitance (example WRV 9/700 M)**

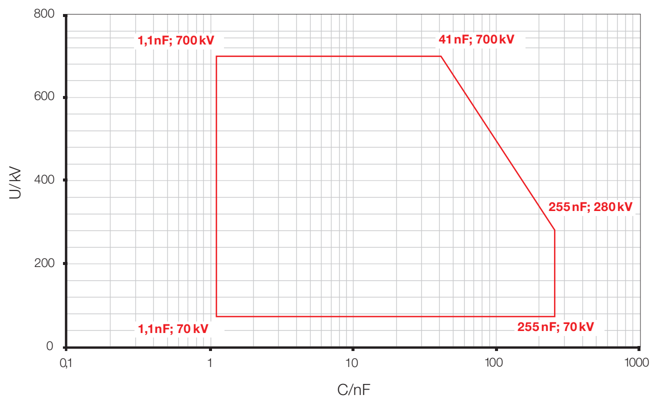

Fig. 7 **Operating range of test system (example WRV 9/700 M)**

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