

VAX/230/214

High Voltage Amplifier



- **Advanced cable diagnostics**
- **Water tree detection**
- **Material characteristics**
- **High voltage frequency sweep**
- **Patented high voltage divider**
- **Output signal up to 30 kV peak**
- **Measurement on grounded test objects**

Description

The VAX comprises a high voltage amplifier that amplifies the output signal from the IDAX system up to 30 kV peak (10 kV VAX214). A patented resistive voltage divider provides voltage feedback to the IDAX system, this instead of a compressed gas capsule that puts restrictions on transportation. Further, the VAX comprises an isolation transformer that promotes measurements on grounded test objects.

The unit is intended for use in testing laboratories and for diagnostics of XLPE cables in high-voltage substations.

High Voltage Amplifiers for advanced polymer cable diagnostics using IDAX Insulation Diagnostic Analyzers.

The life of a piece of equipment is usually limited by the life of the electrical insulation. Therefore, knowing the status of the electrical insulating material in an installation is of utmost importance to the net management. The reasons may vary; personnel safety, increasing demand for secure power deliveries as well as economic aspects.

The VAX Voltage Amplifier is used with the IDAX system to increase the output voltage. The main application for this combination is for diagnosis of water tree deteriorated XLPE-cables. The system works equally well when other types of nonlinear materials are to be characterized.

The IDAX system uses DFR (dielectric frequency response), also known as FDS (Frequency Domain Spectroscopy), i.e. measurements of the capacitance and loss of a material as a function of frequency. The method show significant advantages in the interpretation of the results, especially compared to simplified methods like measurement of dissipation factor, tan delta, at a fixed frequency.

Application

Water treeing

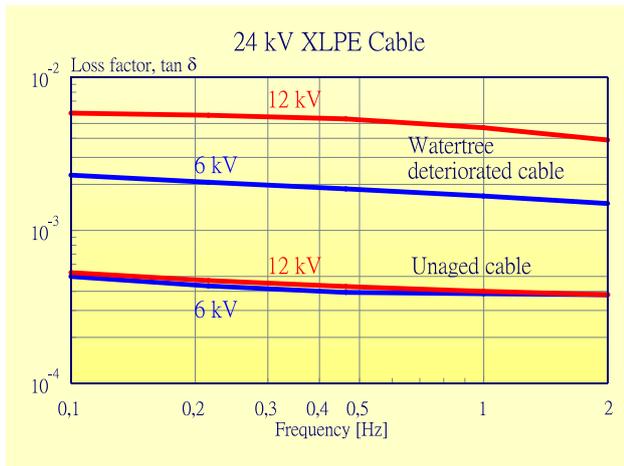
Many types of XLPE cables of the first generations are suffering from a degradation problem known as water treeing. This will gradually decrease the voltage with-stand of the cable and eventually a breakdown will occur.

However, water trees in XLPE cables can be detected and diagnosed by high voltage Dielectric Frequency Response (DFR).

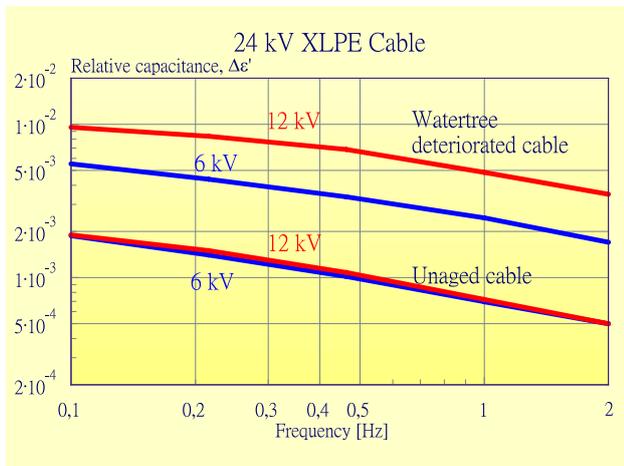


Water trees in a 0,5 mm slice of a 24 kV XLPE cable with tape and graphite insulation screen.

The response of water trees is an increased nonlinear loss and capacitance. The losses of a new cable are low and linear with voltage. However, a service aged cable show an increased loss and a strong nonlinearity of the losses and the capacitance. The picture above shows a typical water tree response.



The loss factor, $\tan \delta$, measured on a new cable and a service aged cable deteriorated with water trees.



The relative capacitance measured on a new and a service aged cable deteriorated with water trees

Safety

As safety is of utmost importance working with high voltage, the VAX unit has several safety features. Two 4 mm banana jacks are provided as an interlock function that can be connected to an external door-guard or similar. A closure must exist between these two terminals in order for the unit to function.



Emergency switch HV On/Off

An emergency switch is located on top front panel and disconnects the mains voltage from the VAX. The High Voltage ON/OFF switch ensures controlled discharge of the test object as long cables, being a large capacitance, can withhold high voltage for a long time after the test is finished. A plastic cover protects inputs/outputs on the front of the high voltage amplifier.

A connection for a warning beacon is provided beside the interlock inputs. The red/orange beacon (see picture below) is activated when the internal high voltage supplies are activated. The beacon must be connected in order for the unit to function. The beacon has a magnetic base for easy attachment on a cable cabinet,

transformer tank or similar and is delivered with a 20 m (65 ft) cable.



Warning beacon

Test system

The whole process and the VAX is controlled by the IDAX Insulation Diagnostic Analyzer (IDAX-300 below) and the sweep needed to diagnose the cable takes about six minutes to complete. Test data from a DFR (FDS) measurement gives the utility superior decision making information concerning the condition of the cable compared to less advanced methods, thus saving time and money as well as avoiding blackouts and urgent, expensive service projects.



IDAX-300 Insulation Diagnostic Analyzer

Specifications VAX

Specifications are valid at nominal input voltage and an ambient temperature of +25°C, (77°F). Specifications are subject to change without notice.

Environmental

Application field The instrument is intended for use in medium and high-voltage substations and industrial environments.

Ambient temperature

Operating 0°C to +55°C (32°F to +131°F)

Storage -20°C to +55°C (-4°F to +131°F)

Humidity < 75%RH, non-condensing. VAX must not be operated under wet or damp conditions.

CE-marking

EMC 2004/108/EC

LVD 2006/95/EC

General

Mains voltage 115 / 230V AC, 50 – 60 Hz

Power consumption 1500 VA (max)

Protection 32 mm glass tube fuse
100-120 V 12A slow-blow
200-240 V 6A slow-blow

Interface IDAX EXTERNAL
VAX can be used together with the following IDAX systems:
IDAX-206, IDAX-206 FR, IDAX-300

Dimensions

VAX-230 1185 x 780 x 555 mm
(36.8" x 30.7" x 21.8")

VAX-214 935 x 780 x 555 mm
(46.5" x 30.7" x 21.8")

Weight

VAX-230 110 kg (242 lbs) without accessories

VAX-214 90 kg (198 lbs) without accessories

Safety

Emergency switch Interrupts the power to the unit. The switch is located on the front.

Beacon Orange beacon with magnetic base and 20 meter cable

Interlock 2 x 4 mm banana jacks for external guard function e.g. door opening function

HV On/Off Switch Ensures controlled discharge of test object capacitance

IDAX Interface The IDAX EXTERNAL connector is used for connecting the unit to the IDAX system using an IDAX multi-cable. This connector provides remote on/off feature, voltage control and voltage feedback

Output

Voltage 30 kV peak (10 kV peak VAX-214)

Current Above 0.2 Hz: 0 – 40 mA peak
Below 0.2 Hz: 0 – X mA peak where X is decreasing linearly from 40 mA peak (at 0.2 Hz) to 15 mA peak (at 0.001 Hz)

Frequency range 1 mHz - 100 Hz

Capacitive drive capability 10 uF

Measurement

The capacitance and tan delta inaccuracy is the same as for the IDAX system operated alone, except that the range is limited according to these specifications. The tracking parameters specify how closely the system follows the sample capacitance and dissipation factor as the frequency and voltage changes. The capacitance tracking parameter is a measure of the non-linearity in the system.

Capacitance tracking 2×10^{-4}

Tan tracking 5×10^{-5}

Ordering information

Item	Art. No.
VAX 230	
230 V Mains voltage	AF-29090
115 V Mains voltage	AF-29092
VAX 214	
230 V Mains voltage	AF-49094
115 V Mains voltage	AF-49092
Included accessories	
Mains cable	
Ground cable, 5 m (16 ft)	
Multi cable, for connecting to IDAX 3 m (10 ft)	
High voltage cable, 20 m (65 ft)	
Warning beacon, 20 m (65 ft)	
User's Manual	
Optional accessories	
High voltage cable, 30 m (98 ft)	GC-30730
High voltage cable, 40 m (131 ft)	GC-30740
Beacon extension cable, 20 m (65 ft)	GC-30770

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