

DVS3 Relay Test System



Features

- 3- ϕ Voltage output from 1- ϕ supply
- 0-130V ϕ -N output voltage, 0-260V ϕ -N with optional VT box
- Variable Frequency 40-999.9Hz
- Phase shift $\pm 180.0^\circ$
- Multi-function timing system
- Ideally suited to testing G59 schemes
- Step change of phase
- Rate of change of frequency
- Large back-lit liquid crystal display
- Compact and lightweight
- Automatic mains voltage selection

The DVS3 heralds the advent of a new breed of manually controlled relay test system. This unit is very easy to use, but does not restrict the creativity of the test engineer. Equally at home in a commissioning, maintenance, or laboratory environment, the DVS3 is a truly flexible system. Real benefits are offered in cost-effective and reliable testing of relay systems.

This relay test system has been designed using the latest digital technology to generate a highly stable

and accurate output with very low distortion. Each phase output is individually adjustable for voltage and phase angle. In addition, full control of frequency is available. Step changes of any quantity may be generated with automatic timing of the relay under test.

The unit is controlled by a simple user interface with context sensitive menus. Values may be either typed in at the keypad or smoothly varied using a digital potentiometer.

The display on the DVS3 is back-lit and exceptionally clear. Menu options on the left are selected by dedicated buttons on the panel next to the display, allowing immediate access to adjust voltage, phase and frequency. Phase to phase and phase to neutral voltages are both shown on the display, along with frequency and phase information. A graphical vector diagram is shown, as is the state of the two contact inputs.



The DVS3 is ideally suited to testing G59 protection, including loss of mains protection. Any protection that can be tested with three voltages (within the range of the outputs) can be tested, including:

- Under and over frequency relays
- Under and over voltage relays
- Synchronising relays
- ROCOF relays
- Vector surge relays
- Transducers

In conjunction with a current source (such as the 200ADM), the DVS3 can be used to test protection requiring current injection with a phase-shiftable voltage including:

- Directional relays
- Distance protection
- Power transducers



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DVS3 Specification

Output

The output of the DVS3 has four 4mm safety sockets for phases A, B, and C and neutral. The neutral connection may be omitted for a delta connection.

Voltage	0-130VAC phase-neutral 0-225VAC phase-phase
Current	120mA for voltages 50-130V 2.4mA/V for voltages 0-50V
Voltage resolution	0.1V phase-neutral
Voltage accuracy	$\pm 0.3\% \text{rdg} + 3\text{d}$

Timing System

The timing system on the DVS3 is flexible and transparent in operation. Creating a step change of any value by typing in a value on the keypad automatically causes the timer to be reset and started when the enter key is pressed. The timer then stops on a change of state of either contact input. More complex timing functions are handled by the PF-F-PF mode.

Two contact inputs are provided, both of which have LEDs and a mimic on the display to show the contact state. The contact inputs auto-select for normally open or normally closed contacts. A DC voltage can also be used to trigger the timer using the Vdc contact.

Timer resolution	1ms
Timer full scale	999.999s
Timer accuracy	$\pm 0.01\% \text{rdg} + 1\text{d}$
Contact O/C voltage	24V
Contact S/C current	10mA
Vdc input range	24-240Vdc

Protection and Safety

The DVS3 is CE marked and is designed to meet the requirements of BS EN61010.

The outputs are protected by overcurrent and thermal trips, and the contact inputs are protected by PTC thermistors. The phase lock current input is fuse protected, and the voltage input is impedance protected. An earth terminal is provided for connection to a local earth.

Supply Requirements

115V $\pm 10\%$, 230V $\pm 10\%$ 45-65Hz 1ph 425VA max
The correct range is automatically selected by the DVS3.

Temperature Range

Storage -20°C to 45°C Operating 0°C to 45°C

Lead Set Specifications

1 x 3m 4 core output lead terminated in 4mm plugs
1 x 3m 2 core timer lead terminated in 4mm plugs

Dimensions	Weight
420mm x 320mm x 230mm	10.8kg

Accessories

Output lead set, lead set case, mains lead, spare fuse set, operating manual.

Optional Accessories

Printer, 130:260V step up VT box, 130:286V step up VT box.

Modes of Operation

Variable Frequency Mode

This mode allows full control of frequency, voltage and phase. The voltage and phase may be controlled individually for each phase or for all three phases together. All parameters are continuously variable using the adjust control, and step changes of any value may be generated by typing the required value on the keypad. The new value is applied to the output when the enter key is pressed. The timer automatically resets and starts when a step change of value is entered, and stops if either contact input changes state. Step changes of phase for testing Vector Surge relays are easily generated in this mode.

Frequency resolution	0.01Hz 40.00-99.99Hz 0.1Hz 100.0-999.9Hz
Frequency accuracy	$\pm 0.01\% \text{rdg} + 1\text{d}$
Phase resolution	0.1°
Phase accuracy	$\pm 0.3^\circ$ phase to phase

Phase Lock Mode

The frequency and phase of the output are controlled by an external reference in phase lock mode. The reference may be the mains supply to the DVS3, an external voltage, or an external current.

This mode allows testing of directional and distance protection in conjunction with an external current source.

Phase lock range	45-65Hz
External voltage ref.	20-250V AC
External current ref.	0.2-5A AC
Phase resolution	0.1°
Phase accuracy	$\pm 0.3^\circ$ phase to phase $\pm 3.0^\circ$ reference to output

ROCOF (Rate Of Change Of Frequency)

Loss of mains protection often takes the form of a ROCOF relay, which is sensitive to rates of change of frequency. The DVS3 is able to generate a swept frequency output with accurate rates of change of frequency between preset frequencies. The rate of change may be continuously varied to find the relay setting or stepped to time the relay.

Frequency range	45.00-65.00Hz
Default sweep range	49.75-50.25Hz (50Hz supply) 59.75-60.25Hz (60Hz supply)
Rate of change range	0.010-2.000Hz/s

Pre-fault - Fault - Post-fault Mode

PF-F-PF mode allows extra flexibility in testing where complex events must be timed or several sets of values must be applied to a relay in turn. This mode allows three sets of values to be set in advance (pre-fault, fault, and post-fault values). The DVS3 may be set to switch from one state to the next on a change of contact or after a specific time. In addition, the timer may be set to start or stop on any one of the state changes of a change of contact state. This mode allows frequency, phase and voltage to be changed simultaneously if required. For example, one phase could be collapsed at the same time as a change in frequency is applied.