

**INDEPENDENT POWER TRANSMISSION OPERATOR S.A.
TRANSMISSION SYSTEM MAINTENANCE DEPARTMENT
CENTRAL SERVICES BRANCH
PROTECTION SECTION**

**TECHNICAL DESCRIPTION
THREE - PHASE DIGITAL TEST DEVICE
FOR PROTECTION RELAYS
No 30**

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TECHNICAL DESCRIPTION No 30

OH THREE-PHASE DIGITAL TEST DEVICES FOR PROTECTION RELAYS

1. PURPOSE

This technical description concern a three - phase digital testing device to be used for the field or laboratory testing of the protective relays (digital & conventional) which are connected to the IPTO transmission network.

All the required specification of equipment shall be in accordance with the following.

2. OPERATING ENVIRONMENT

The protection relays which shall be tested are installed in HV/EHN substations of the following type :

- * Distance relays
- * Overcurrent/overload relays
- * Frequency relays
- * Voltage relays
- * Differential relays
- * Generator protection relays
- * Synchronization equipment
- * Other function related with the use of relays such as autoreclosing etc.

3. TECHNICAL DESCRIPTION OF DEVICES

- The offered devices will be used for tests of the protective relays in IPTO substations and power stations, therefore the equipment shall be portable having small volume and which will not exceed 25 kg in transport case. It is mentioned that volume and weight will be critical parameters with preference in one box solution.
- The transport case will be sealed providing shock and vibration resistance.
- The testing devices shall be operated (or stored) in the following ambient conditions :
Temperature : $0 \div 40^{\circ}\text{C}$ (operation) $-10 \div 50^{\circ}$ (Storage)
Humidity range : $5 \div 95\%$ (relative, non-condensing)
- Connection of device with the power supply will be one-phase.
- Power supply nominal voltage will be : 220 V AC(one-phase)
- Frequency of power supply 50 Hz.
- Current output (AC) of the device for three - phase load will be in the range $0 \div 25$ A for each of the three outputs with output power >140 VA per phase.
- Voltage output (AC) of the device for three phase load will be in the range $0 \text{ V} \div 300$ V for each of the three outputs with output power >75 VA per phase.
- Voltage output (DC) for relay power supply : up to 250 VDC, up to 50 W
- All outputs will be adjustable independently and continuously by amplitude, phase $0^{\circ} \div 360^{\circ}$ and frequency (10-1000 Hz).
- The device will have display capability, or through computer connected to the device.
- Special specification :
Current (accuracy $\pm 0,1\%$ of range/1% of setting)
Voltage (accuracy $\pm 0,1\%$ of range/1% of setting)
Timer (resolution $\pm 0,5$ msec)
Phase angle (resolution $\pm 0,1\%$)
Frequency (resolution ± 1 mHz (50 Hz)
Total harmonic distortion $<2\%$ (50 Hz)

- Binary inputs : minimum 4 (resolution of 0,5 msec, voltage or contact sense)
- Binary outputs: minimum 4 potential free (input voltage : 250 VDC or AC, 0,5 A make or break)
- All output circuits (current and voltage) will be protected of overloading, overtemperature and short - circuit.

4. TECHNICAL DESCRIPTION OF SOFTWARE

- Communication between the user and the device will be either with PC through an interface on the front panel for the connection to the device for adjustments, programming and measurements or through buttons and displays on the front panel of the device.
- Testing of the relays by software will be in the X-R diagram or in the vectors diagram or by phas or values.
- Testing of the relays by software will be automatically or step by step.
- COMTRADE compatible transient playback capability.
- All necessary software for the relays mentioned in paragraph 2 will be user friendly and shall be included in the offered price.
- Above software shall be provided on the basis of a royalty-free, not exclusive, with irrevocable license to use for the operation of the testing devices.
- A list of the digital relays with which the testing devices already preprogrammed to test shall be provided with the offer (indication of relay manufacturer and type).

5. GENERAL REQUIREMENTS

- The items to be offered (hardware/software) will conform to the international standards and will be mentioned in the offer.
- In case of lack of international regulations, conformity to the national standards (i.e. the manufacturer's country standards) applicable for such equipment could be considered, subject to purchaser's approval (VDE, ANSI, BS etc.).
- Type and routine tests in accordance to above standards will be required, while existing certificates and test reports shall be accepted, provided that they will be found satisfactory by the purchaser.
- Manufacturer is obliged to support the devices offered for 10 years at least from the date of purchase and give guarantee of good operation for a period of at least two (2) years.
- After the assignment of the contract information about troubleshooting will be provided.
- All relevant equipment for the operation of the device, testing of relays and communication with PC shall be provided in the offer (e.g. special cables, connectors etc.).
- References will be provided which demonstrate that the offered material have been used at commercial scale.
- A list of users, in the area of power transmission network in EU Countries or/and North America shall be provided.
- Certificates of three users concerning the capabilities of the devices will be taken under consideration in the offer at customer request.
- After the assignment of the contract the manufacturer has to provide all relevant documentation for the operation, testing, repairing and troubleshooting in English or Greek language.