

**Annexure M7****Scope of work/Works Information/Employers Requirements- 3 ITEM LINES**

<b>Item</b>	<b>Material</b>	<b>Description</b>	<b>Required Quantity</b>	<b>Unit Price</b>
<b>1.</b>	<b>0191044</b>	<b>TESTER:SECONDARY INJECTION TEST SET - HARDWARE – SUPPLY MATERIAL AND ACCESSORIES</b>  <b>Power Supply</b>  Nominal Voltage  230 V, Single Phase  Permissible Voltage Range  90 V - 260 V  Nominal Frequency  50 Hz  Permissible Frequency Range  45 Hz - 65 Hz  Power Consumption  Max 3450VA at 230VAC  Rated Current  15A at 230VAC	<b>1</b>	

		<p>Connection</p> <p>Standard AC sockets: Connector (SANS 60320-1, C13) and Inlet (SANS 60320-1, C14)</p> <p><b>Dimensions and Weight</b></p> <p>Volume</p> <p>max. 30 litre</p> <p>Weight</p> <p>max. 20 kg</p> <p><b>Environment</b></p> <p>Operating Temperature</p> <p>0 °C ... 50 °C</p> <p>Storage Temperature</p> <p>-25 °C ... 70 °C</p> <p>Humidity</p> <p>5 % ... 95 % r.h. (non-condensing)</p>		
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	<p><b>Certificates</b></p> <p>Vibration</p> <p>IEC 60068-2-6</p> <p>Shock</p> <p>IEC 60068-2-27</p> <p>CE</p> <p>Yes</p> <p>EMC</p> <p>The product adheres to the electromagnetic compatibility (EMC) Directive 2004 / 108 / EC (CE conform)</p> <p>EMC - Emissions</p> <p>IEC 61326-1 Class A; IEC61000-6-4; IEC61000-3-2/3;</p> <p>FCC Subpart B of Part 15 Class A</p> <p>EMC - Immunity</p> <p>IEC 61326-1; IEC 61000-6-2; IEC 61000-4-2/3/4/5/6/11</p> <p><b>Safety</b></p> <p>The product adheres to the low voltage Directive 2006 / 95 / EC (CE conform)</p>		
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		<p>IEC 61010-1; Insulation of PC and SELF Interfaces complies with EN 60950-1</p> <p><b>Independent Test Laboratory</b></p> <p>Copies of test certificates from independent test laboratories proving compliance with the above standards are to be supplied together with the tender</p> <p><b>Hardware</b></p> <p><b>General</b></p> <p>All functions should be combined in one hardware unit</p> <p>The unit shall be of a robust and sturdy construction</p> <p>PC card design: Wire jumpers on a single printed circuit board are not permissible</p> <p>Electronic components: No potentiometers are allowed</p> <p>No moving elements or elements that are susceptible to damage, i.e. control elements or displays on the face plate are permissible</p> <p><b>Output Amplifiers</b></p> <p>The amplifier stages are to be fully electronic, i.e. not via transformer</p> <p>All current amplifiers to be fully protected and proof against any open-circuit-, overload-, overburden- and over-temperature- condition. Any such condition is to be immediately displayed in all active software modules. Except for an over-temperature condition an automatic shut down of the amplifiers is NOT permissible</p>		
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	<p>All voltage amplifiers to be fully protected and proof against any short-circuit-, overload-, overburden- and over-temperature- condition. Any such condition is to be immediately displayed in all active software modules. Except for an over-temperature condition an automatic shut down of the amplifiers is NOT permissible</p> <p>All amplifiers to use linear amplification elements and to be dc-coupled</p> <p>Ability to generate dc and ac signals</p> <p>The amplifiers, low-level outputs, the measurement inputs and the main power supply to be galvanically isolated from each other and earth (2kV insulation voltage)</p> <p><b>Voltage Amplifiers</b></p> <p>Setting range</p> <p>4x 0..300Vrms (L-N), 3x 0..520Vrms (L-L)</p> <p>Single phase operation</p> <p>1x 0..600Vrms (L-L)</p> <p>Output power</p> <p>3x 100VA at 100..300V (L-N) or</p> <p>1x 200VA at 100..300V (L-N) or</p> <p>1x 275VA at 200..600V (L-L)</p> <p>Maximum load current</p>		
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		<p>3x 1Arms; 1x 2Arms</p> <p>Accuracy</p> <p>error &lt; 0.03% of reading (0..300V) + 0.01% of range</p> <p>THD+N</p> <p>&lt; 0.015%</p> <p>Phase error</p> <p>&lt; 0.05°</p> <p>Connection</p> <p>4mm Banana sockets</p> <p>amplifier combination plug (3xV and 3xI)</p> <p><b>Current Amplifiers</b></p> <p>Setting range</p> <p>6x 0..32Arms</p> <p>3x 0..64Arms</p> <p>Single phase operation</p> <p>1x 0..128Arms</p> <p>Output power</p>		
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	<p>6x 430VA at 25A</p> <p>3x 800VA at 50A</p> <p>1x 1000VA at 80A (LL-LN) or</p> <p>1x1740VA at 25A (L-L-L-L)</p> <p>Maximum compliance voltage</p> <p>6x 35Vpk</p> <p>1x 140Vpk</p> <p>Accuracy</p> <p>error &lt; 0.05% of reading (0..32A) + 0.02% or range</p> <p>THD+N</p> <p>&lt; 0.05%</p> <p>Phase error</p> <p>&lt; 0.05°</p> <p>amplifier combination plug (3xV and 3xI)</p> <p>Independent amplifiers- The six current amplifiers are to be independent from the four voltage amplifiers. The neutrals between the two current output groups are to be galvanically isolated (up to 2kV) to allow for series connection of the two groups in order to boost the compliance voltage</p> <p><b>Connection</b></p>		
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	<p>4mm Banana sockets</p> <p><b>Low-level signal Generators</b></p> <p>6 additional analog low level signals to control external amplifiers or to test relays with low-level input, e.g. from Rogowski coils, linear voltage or linear current sensors must be provided. To allow for expandable options from 6 to 12 outputs.</p> <p>Full simulation of Rogowski coil signal (i.e. first order differential of signal) to be performed in hardware.</p> <p>Testing the Sub Synchronous Resonance (SSR) numerical relays at Koeberg and for the injection of White Noise signals into the AVR for grid compliance testing.</p> <p>Together with 10 internally used signal generators the system should provide 16 independent signal channels in total</p> <p>Output settings range</p> <p>0 ... 10 Vpk</p> <p>Accuracy</p> <p>&lt;0.025%</p> <p>Overload Protection- Yes</p> <p>The quantities displayed in the software must be saleable for primary or secondary voltages (or currents).</p> <p>Should be able to couple to other auxiliary devices or possible synchronising function.</p>		
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		<p><b>Signal Generation</b></p> <p>All outputs to be continuously and independently adjustable in amplitude, phase (0 to +/- 360°) and frequency.</p> <p>Able to generate continuous sine waves with a frequency between 10 and 1kHz and to generate transient files with a bandwidth from dc up to 3 kHz.</p> <p>Frequency error to be less than 0.5 ppm.</p> <p>Phase error to be less than 0.02°</p> <p><b>Binary Inputs</b></p> <p>Number of inputs- 10 in at five galvanic isolated groups (2kV insulation voltage)</p> <p>Mode/Trigger criteria- Pick-up and drop-out of potential-free contacts or dc voltages of up to 600Vdc. Trigger levels to be adjustable</p> <p>Max. Input Voltage- 600V</p> <p>Max. error</p> <p>&lt; 100 µs</p> <p>Counting function- Inputs capable of counting number of pulses up to 3kHz.</p> <p>Connection- 4mm Banana sockets</p>		
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	<p>Analogue Inputs for Measurement</p> <p>Number- 10 in five galvanic isolated groups (2KV insulation voltage)</p> <p>Input ranges- 100mV, 1V, 10V, 100V, 600V</p> <p>Accuracy</p> <p>&lt;0.06%</p> <p>Bandwidth- dc..10kHz</p> <p>Sampling frequency- 3kHz to 28kHz</p> <p>Overload protection- Yes</p> <p>Recording buffer- 300s for 1channel at 3kHz, 3.5s for 10 channels at 28kHz</p> <p>Connection- 4mm Banana sockets</p> <p><b>Analog low level measuring inputs for transducer testing</b></p> <p>Direct current range</p> <p>Range 1: 0 ... <math>\pm 1</math> mA</p> <p>Range 2: 0 ... <math>\pm 20</math> mA</p> <p>Direct voltage range</p> <p>0 ... <math>\pm 10</math> V</p> <p>Max. error</p>		
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		<p>&lt; 0.003%</p> <p>Connection</p> <p>4mm Banana sockets</p> <p><b>Auxiliary DC supply to power test objects</b></p> <p>Range</p> <p>Range 1: 0 ... 264 Vdc, 0.2A</p> <p>Range 2: 0...132 Vdc, 0.4A</p> <p>Range 3: 0...66 Vdc, 0.8A</p> <p>Power</p> <p>max. 50W</p> <p>Max. error</p> <p>&lt; 2%</p> <p><b>Binary output contacts</b></p> <p>Number- Minimum 4</p> <p>Breaking capacity- 300V, 8A, 2000VA or 50W</p> <p>Type- Dry contacts that can be used to switch ac or dc</p>		
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	<p><b>Time Synchronization</b></p> <p>The test set should be able to synchronise to a GPS clock via a 1pps or IRIG B signal.</p> <p>Timing accuracy for 1pps / IRIG-B: 1 <math>\mu</math>s.</p> <p>Maximum distance between GPS receiver and test equipment for 1pps signal: 40m.</p> <p>Test set needs to be synchronise to the IEEE 1588 Precision Time Protocol (PTP) via Ethernet.</p> <p>Timing accuracy for PTP: 100ns.</p> <p>Maximum distance between GPS receiver and test equipment for PTP: 2000m.</p> <p>IEEE 1588 / PTP clock to be powered over Ethernet (PoE), i.e. no separate power supply should be necessary.</p> <p><b>Interface to PC / Laptop</b></p> <p>Interface to the IBM compatible PC via Ethernet interface OR USB</p> <p>10/100Mbit/s copper (autosensing, auto crossover) via RJ45 connector</p> <p>Note: Centronics parallel port (Lpt) and/or serial RS232 ports are not permissible as modern laptops do not provide such ports.</p> <p>Two Ethernet communications ports to support communication on a process bus (IEC 61850-8-2 (GOOSE), IEC 61850-9-2LE (Sampled Values) and UCA2.0) AND station bus at the same time.</p>		
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	<p>Communications card to support IEEE 1588 / Precision Time Protocol (PTP) to synchronize the test set to a PTP enabled Grandmaster clock in the substation for End-to-end tests / Synchro phasor tests.</p> <p><b>Software</b></p> <p>Download test templates created to the test set.</p> <p>Display all test set parameters.</p> <p>Create graphs from relay test results</p> <p><b>General</b></p> <p>Windows 10 (32bit and 64bit) software. Long filenames, tool tip help, context sensitive menu function (right mouse click) and an integrated help browser must be provided.</p> <p>All software functions, options and actions should be easily available by click of a button and/or shortcut key to avoid having to navigate through complicated menu structures and having to drill through multiple menu levels. The Microsoft ribbon based menu structure used in Office 365/ Office 2010 / Office 2013 is an example of sorting all functions, options and actions and making all easily accessible in the right place.</p> <p>No programming to be necessary to test an application - entry of setting parameters to be all that is required to set up and perform a test</p> <p>Future expansions in functionality by means of software updates. Firmware updating to be handled by the software, i.e. exchange of any hardware components is not permissible.</p> <p>Generation of reports on paper or file. All graphics and text to be printable.</p>		
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	<p>Test report must be configurable to include custom information in graphical format (e.g. logos, wiring diagrams) and text format (tester, date of test, substation, reminders)</p> <p>The test set software should be able to import relay settings records from relay setting softwares (or relay settings databases) in a text file and/or XML format. An example is the XRIO file format for the transfer of relay setting parameters for all types of relays.</p> <p>It must be possible to test multi-function relays / panels with one test routine / document.</p> <p>Test sequence to be pausable at pre-defined points in the test sequence, by popping up a custom instruction dialogue (with or without audible warning), instructing the user to change either a setting on the relay, change of hard wiring or to record a specific measurement / status from the relay / scheme.</p> <p>All testing to be in closed loop.</p> <p>On Line Pass/ Fail assessment for ALL tests. This is particular important for automatic testing.</p> <p>Full automatic testing must be possible, i.e. without launching various test modules manually.</p> <p>Test software to be future proof to allow the complete testing of any new relay, both in form of entry of relay settings as well as testing all functions of such a relay.</p> <p><b>Manual Control Function</b></p>		
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	<p>Direct entry of actual relay settings into test software. Test specific parameters (e.g. set I1 to 110% of I&gt;&gt;) must be automatically re-adjusted according to the entered relay settings.</p> <p>Manual and independent adjustment of amplitude, phase angle and frequency for all generator outputs.</p> <p>Graphical display of natural voltages and currents in a vector diagram.</p> <p>Direct entry sequence components and graphical display in a vector diagram</p> <p>Direct entry of impedances and graphical display in a R/X diagram</p> <p>Direct entry of power and graphical display in P/Q diagram</p> <p>Ramping and stepping of any of the above quantities: one, two or three phases at the same time</p> <p>Pulse ramping function for any of the above quantities</p> <p>Synchronized switching of multiple variables at the same instance in time.</p> <p>Timing function for pick-up and drop-out measurements.</p> <p>On-line Reporting Function</p> <p>Synchronise generator outputs to any third party signal, e.g. mains frequency.</p> <p><b>State Sequencer Function</b></p> <p>Direct entry of actual relay settings into test software. Test specific parameters (e.g. set I1 to 110% of I&gt;&gt;) must be automatically re-adjusted according to the entered relay settings.</p>		
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		<p>Manual testing.</p> <p>Fully automatic testing.</p> <p>Ability to generate test sequences from any number of states. Each state consists of any combination of voltage, current, frequency and any binary output state.</p> <p>Graphical display of natural voltages and currents in a vector diagram.</p> <p>Graphical display of voltages, currents and binary signals over time.</p> <p>Direct entry sequence components and graphical display in a vector diagram</p> <p>Direct entry of impedances and graphical display in a R/X diagram</p> <p>Direct entry of power and graphical display in P/Q diagram</p> <p>Define trigger conditions for each state either in fixed time or dependent upon a logical combination of the binary inputs for accurate timing measurements.</p> <p>Synchronization to GPS / PTP and other digital timing pulses.</p> <p>Automatic assessment of test results (Pass / Fail) with actual results and deviation from nominal.</p> <p><b>Linear Ramping and Pulse Ramping Functions</b></p> <p>Direct entry of actual relay settings into test software. Test specific parameters (e.g. set I1 to 110% of I&gt;&gt;) must be automatically re-adjusted according to the entered relay settings.</p> <p>Manual testing.</p>		
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	<p>Fully automatic testing.</p> <p>Ability to linearly ramp up to two independent variables (e.g. voltage and frequency) at the same time, while keeping the other quantities at a defined constant value.</p> <p>Ability to ramp a single variable in a pulsed fashion i.e. ramped quantity shall be set back to a predefined value between every step to allow the relay to reset.</p> <p>Graphical display of natural voltages and currents in a vector diagram.</p> <p>Graphical display of voltages, currents and binary signals over time.</p> <p>Define trigger conditions for pick-up / drop-out measurements upon a logical combination of the binary inputs.</p> <p>Synchronization to GPS / PTP and other digital timing pulses.</p> <p>Automatic assessment of test results (Pass / Fail) with actual results and deviation from nominal.</p> <p><b>Transient Playback Function</b></p> <p>IEEE COMTRADE (C37.111-1991) compatible (ASCII and binary formats).</p> <p>Synchronization to GPS / PTP and other digital timing pulses.</p> <p>Timing accuracy 1µs.</p> <p>Graphical display of voltage and current traces as well as digital signals and relay responses.</p> <p>Editing of signals: Extending (repeating) and deleting portions of the recorded signal.</p>		
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	<p>Ability to generate composite harmonic wave shapes.</p> <p>Ability to edit own digital signals OR to select recorded binary signals to play back via binary outputs.</p> <p>Unlimited length (in time) of Comtrade file to play back.</p> <p><b>Overcurrent Relay Testing</b></p> <p>Direct entry of actual relay settings into test software. Test specific parameters (e.g. test points) must be automatically re-adjusted according to the entered relay settings.</p> <p>Manual testing.</p> <p>Fully automatic testing.</p> <p>Testing of the operating characteristic (triptime vs. Itest) for all types of fault (earth faults, phase faults, negative sequence and zero sequence faults)</p> <p>Display of overcurrent characteristic and testpoints in I/t diagram.</p> <p>Determination of the pick-up and drop-out current for all fault types.</p> <p>Determination the pick-up and drop-out of directional characteristic for directional overcurrent relays.</p> <p>Breaker simulation: Simulate the 52a and 52b auxiliary contacts of a breaker with the binary outputs, switch the currents off at zero crossing of current after a trip signal has been received.</p> <p>Characteristic formulae: IEC255-4, BS142 and IEEE PC37.112-1995, I2t characteristics to be supported. Definition of custom characteristics must be possible.</p>		
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	<p>Automatic assessment of test results (Pass / Fail) with actual results and deviation from nominal.</p> <p><b>Frequency and Voltage Relays Testing</b></p> <p>Direct entry of actual relay settings into test software. Test specific parameters (e.g. test points) must be automatically re-adjusted according to the entered relay settings.</p> <p>Manual testing.</p> <p>Fully automatic testing.</p> <p>Generation of ramps for amplitudes, phase angles and frequency.</p> <p>Pick-up, timing and stability tests.</p> <p>Graphic and tabular display of relay pick-up and drop-out vs. time.</p> <p>Automatic assessment of test results (Pass / Fail) with actual results and deviation from nominal.</p> <p><b>Distance Relay Testing</b></p> <p>Testing of line impedance relays and field failure characteristics on generator protection relays.</p> <p>Direct entry of the actual relay settings of an IED into the test software must automatically generate the trip characteristic. Any new differential algorithm that is introduced shall be accommodated in a reasonable time period; typically this should be at no cost to the purchaser.</p>		
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	<p>Impedance characteristics supported: Quadrilateral, Mho, Tomato or Lens characteristic.</p> <p>Manual testing.</p> <p>Fully automatic testing.</p> <p>Test the trip time at specific fault impedances. Fault impedances must be specifiable in relation to zone reaches, e.g. 90% Z1. Automatic assessment of whether the tested trip time is passed or failed.</p> <p>Check the reach of a relay by placing a fault shot at the inner and outer tolerance border (i.e. theoretical reach minus and plus the defined reach tolerance of the relay). Automatic assessment of whether the tested reach is Passed or Failed.</p> <p>Automatically test the characteristic in the impedance plane (R/X diagram) and/or in the time grading diagram (Z/t diagram). Automatic assessment of whether the tested reach is passed or failed.</p> <p>Test models supported: constant test current, constant test voltage and constant source impedance.</p> <p>DC offset simulation: Control of angle of fault incidence, time constant of dc offset to be calculated on-line from system parameters (R/L).</p> <p>The separate arc resistance algorithm is to be supported for both earth faults and phase faults (as implemented on numerical distance relays).</p> <p>Apply Pre-fault voltage, i.e. duration settable.</p>		
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	<p>Breaker simulation: Simulate the 52a and 52b auxiliary contacts of a breaker with the binary outputs, switch the currents off at zero crossing of current after a trip signal has been received.</p> <p>Graphical display of analog voltages and currents plus relay contact responses vs. time.</p> <p>Display of injected voltages and currents on a vector diagram in natural and/or in symmetrical components.</p> <p>Testing of auxiliary functions: Manual close, power swing, Auto-reclose function, VT fuse fail.</p> <p>Automatic assessment of test results (Pass / Fail) with actual results and deviation from nominal.</p> <p><b>Differential Relay Testing</b></p> <p>Testing of transformer differential relays, line differential relays, motor / generator differential and busbar differential relays.</p> <p>Direct entry of actual relay settings into test software. Test specific parameters (e.g. test points) must be automatically re-adjusted according to the entered relay settings.</p> <p>Manual testing.</p> <p>Fully automatic testing.</p> <p>Simulation of two and three winding transformers for all possible vector groups (e.g. YY0, YD1, YD11, etc.).</p>		
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	<p>Testing the operating characteristic (<math>I_{diff}</math> vs. <math>I_{bias}</math>) for all types of fault: earth fault, phase faults and three phase faults.</p> <p>The various types of <math>I_{bias}</math> formulae (<math>I_{bias} = ( I_p  +  I_s )/k</math>; <math>I_{bias} = \max(I_p, I_s)</math>; etc; numerical zero sequence elimination and both reference side have to be supported.</p> <p>Testing the harmonic restraint characteristic (<math>I_{diff}</math> vs. %I harmonic) for second harmonic (inrush restraint) and fifth harmonic (overfluxing restraint).</p> <p>Testing of the inrush restraint characteristic for relays which utilize the gap detection technique.</p> <p>Testing the trip time characteristic (triptime vs. <math>I_{diff}</math>) for all types of fault.</p> <p>Test the stability of the relay to confirm the correctness of the vector group correction, CT mismatch correction and zero sequence elimination.</p> <p>Apply pre-fault current, i.e. through fault current condition. Test current and duration settable.</p> <p>Apply voltage in addition to six currents - according to HV or LV voltage</p> <p>GPS / PTP synchronized End-to-end tests to test the operating characterisitic of line differential relays, i.e. by simulating either the local or remote end of a line.</p> <p>Automatic assessment of test results (Pass / Fail) with actual results and deviation from nominal.</p>		
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		<p><b>Synchronising Devices and Synchronising Check Devices</b></p> <p>Direct entry of actual relay settings into test software. Test specific parameters (e.g. test points) must be automatically re-adjusted according to the entered relay settings.</p> <p>Manual testing.</p> <p>Fully automatic testing.</p> <p>Adjustment control mode to be tested closed loop.</p> <p>Graphical of quantities in a DV/Df diagram as well as relative phase angles in a synchronoscope.</p> <p>Feedback signals: closing pulse and adjustment pulses (V+, V-, f+, f-). Display of adjustment controls vs. time.</p> <p>Automatic assessment of test results (Pass / Fail) with actual results and deviation from nominal.</p> <p><b>Testing with GOOSE Messages</b></p> <p>All the above protective relay test modules must be support testing for IEC 61850-8-2, i.e. be able to trigger on GOOSE message as well as simulate GOOSE message (if need be).</p> <p>Import of SCD, ICD of GOOSE sniffer files to configure the triggering / simulation of GOOSE messages.</p> <p>Sensing of up to 360 simultaneous GOOSE message must be possible.</p>		
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		<p><b>Testing with Sampled Values</b></p> <p>All the above protective relay test modules must be support testing for IEC 61850-9-2LE, i.e. be able to simulate all voltages and currents as Sampled Value signals.</p> <p>Simulation of up to THREE sets of IEC 61850-9-2LE signals must be possible.</p> <p><b>Testing Single and Three Phase Transducers</b></p> <p>Manual testing.</p> <p>Automatic testing.</p> <p>Generation of sweeps for amplitudes, phase angles, frequency, power (W, VA, Var).</p> <p>Individual setting of voltages and currents (ito amplitude, phase angle and frequency) should be possible per test point.</p> <p>For single phase transducers phase injected should be selectable.</p> <p>L-L voltage transducers to be tested with full three phase voltage system.</p> <p>On-line calculation of error (absolute, percentage and full-scale).</p> <p>Display of transducer output and absolute, percentage and full-scale errors vs. sweep quantity graphically and/or as table.</p> <p>Feedback signal: Low-level analog voltage (0..+/- 10V) or current (0..+/-20mA)</p>		
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	<p>Automatic assessment of test results (Pass / Fail) with actual results and deviation from nominal.</p> <p><b>Energy meter testing according to IEC 62053</b></p> <p>Manual testing.</p> <p>Automatic testing.</p> <p>Load test, No-load test, creep test, mechanism test, Injection test.</p> <p>Ability to generate automatic load profiles, i.e. test the meter for different load conditions.</p> <p>On-line display of error.</p> <p>"Feedback signal via optical pick-up / scanning head:</p> <p>Meter pulses of up to 100 KHz"</p> <p>Third Harmonic Test</p> <p>DC test</p> <p>Automatic assessment of test results (Pass / Fail) with actual results and deviation from nominal.</p> <p><b>Power Quality Signal Generator</b></p> <p>Testing of Power Quality measurement devices as per the standards to NRS 048-2 / SANS/IEC 61000-4-30; SANS/IEC 61000-4-7; BS EN/IEC 61000-4-15 and IEC 62586</p>		
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		<p><b>On-line Multimeter Measurement Function</b></p> <p>Up to 10 independent inputs</p> <p>Software to display amplitudes and phase angles of ac voltages and currents, symmetrical components of voltages and currents, line to line voltages, frequencies, power (active, reactive and apparent) and cos(phi) independently for each input.</p> <p>All ac measurements to be true RMS.</p> <p>On-line vector diagram for voltages and currents as well as power.</p> <p>On-line measurement of Vdc, Idc and dc power for each input.</p> <p>On-line display of harmonics measured both numerically (in a table per harmonic frequency) and graphically in a bar graph.</p> <p><b>Transient Recording Function</b></p> <p>The recording function should enable recordings at the specified sampling frequency.</p> <p>Any recordings done, should automatically be uploaded to the controller PC.</p> <p>The recordings should be saved in COMTRADE format on the PCs harddrive.</p> <p>Trigger conditions: amplitude, swell and sag, harmonic, frequency, frequency change, notch as well as any combination of these triggers.</p>		
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	<p>A pre-trigger buffer should be definable.</p> <p>Analysis software should be provided to analyze the recorded waveshapes in terms of analog waveshapes (RMS and instantaneous values), vector diagram, impedance plots (L-N and L-L fault loops) as well as harmonics.</p> <p>For impedance plots, the relays impedance characteristic should be displayable in relation to the impedance trajectory measured by the relay.</p> <p><b>System-based testing of relays</b></p> <p>Provide a power systems based simulation software to test the function of a relay in the primary power system, i.e. by specifying the primary power system topology (e.g. from a single line diagram) and power systems parameters (network source impedances, line and transformer impedances, CT and VT parameters).</p> <p>Allow definition of power system events, e.g. any type of fault (L-N, L-N, L-L-N and L-L-L faults) as well as switching event (opening of closing of breakers)</p> <p>Full Transient simulation simulating power system phenomena such as DC offset, saturation of CTs, power swings, series compensated lines, transformer in-rush, etc.</p> <p>Distributed testing, i.e. injecting multiple test set simulating voltages and currents and different points in the network from ONE PC - even when the test sets are physically NOT in the same location (e.g. at different ends of a line)</p> <p><b>Special applications:</b></p>		
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	<p>Line impedance protection scheme on series compensated lines with tele-protection</p> <p>Line differential protection system testing (up to three terminals)</p> <p>Power transformer differential relay testing with internal winding faults</p> <p>Bus zone system testing for out-of-zone through faults, in-zone faults, dead-zone faults as well as isolator transition faults</p> <p><b>ARC flash simulation</b></p> <p>Facility to simulate an arc flash with a high intensity flash bulb inside medium voltage switchgear for trigger the arc flash sensor units of IEDs using both point sensors as well as linear fibre sensors.</p> <p><b>Standard Accessories</b></p> <p>Generator combination cable- to combine 3xV and 3xI into one test lead, 8x 4mm banana plugs</p> <p>Measurement leads-12 x 2 m; 2 mm<sup>2</sup></p> <p><b>Other accessories:</b></p> <p>South African power cord</p> <p>Connection lead from test set to PC</p> <p>Various connection accessories</p>		
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	<p>Hardcover carrying cases for test hardware (with retractable handle and wheels if available)</p> <p>Soft bag for test set and accessories</p> <p>Instruction Manual</p> <p>Software for report downloading and configuration as well as offline test sequence generation.</p> <p><b>External integrated antenna PTP clock (GPS)</b></p> <p>"The device should consist of a GNSS Antenna, GNSS Receiver and CPU combined in one unit and be weatherproof.</p> <p>The device should be easily setup.</p> <p>No RF cabling shall be required.</p> <p>The device should operate using an Ethernet cable up to 100 meters.</p> <p>The device should use extremely low power.</p> <p>To power up the device no additional power supply will be needed and should use powered over Ethernet (POE)."</p> <p>"Multiple time protocols shall be supported e.g. PTP and NTP timing networks.</p> <p>The device should fully support the following PTP profiles:</p> <p>IEEE 1588 default profile</p>		
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		<p>IEEE C37.238-2011</p> <p>IEEE C37.238-2017</p> <p>IEC/IEEE 61850-9-3:2016"</p> <p><b>MPTS hardware configurations</b></p> <p>Calibration, Repair and Annual Reports</p> <p><b>Guarantee</b></p> <p>The unit and accessories shall be guaranteed for a period of at least 5 years. The guarantee may exclude any damage or failure that is deemed to have occurred due to negligence or abuse</p>		
2.	0664173	<p><b>ANALYZER:SECONDARY INJECTION;0-100 PCT- GENERAL</b></p> <p>A standalone and IED vendor independent PC software to examine IEC 61850 devices, unveil the inside view of any IEC 61850 IED, browsing and discovering the IED's data model, monitor IEC 61850 activity and work with SCL files</p> <p><b>Standards</b></p> <p>IEC 61850 Edition 1: Communication networks and systems in substations</p> <p>IEC 61850 Edition 2: Communication Networks and Systems in Power Systems</p> <p>IEC 61850-7-41-:2013</p> <p>IEC 61850-7-420: 2009</p> <p>IEC 61400-25-1:2006...-6:2010</p>	1	

	<p><b>Software Functions</b></p> <p>Universal client for IEC 61850 servers</p> <p>Unveil the inside of IEC 61850 devices via navigation view, detail view and an activity monitor</p> <p>Discover IEDs via sniffing function</p> <p>Import and analyse SCL files</p> <p>Save SCL files</p> <p>Browse IED according to the IEC 61850 data attributes</p> <p>Writing data and control structures</p> <p>Analysing Client/Server traffic on ACSI level</p> <p>Subscribe and simulate GOOSEs</p> <p>GOOSE sniffing</p> <p>Simulate IEC 61850 Ed.1 and Ed.2 IEDs</p> <p><b>Minimum PC Requirements for Software</b></p> <p>PC type- Windows 10 (32bit or 64bit), with the possibility to upgrade to Windows 11</p> <p>RAM- A computer with x86 or x64 architecture</p> <p>Hard disk Space- 4GB</p> <p>Ethernet Port -2GB</p>		
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		<p>Licensing mechanism- An Ethernet adapter with TCP/IP protocol bound to it, Software is licensed to the CPU via the internet. USB software dongles are NOT permissible. Transfer of licenses from one PC to another via internet.</p> <p>Local Support</p> <p>Hotline support hours- LOCALLY based engineers (i.e. from the Southern African region) are to present and demonstrate the software to our engineers at our companies substation on our own test application to prove its suitability to operate in local environmental conditions as well as to be able to test our test objects adequately.</p> <p>Email support- Local telephonic support to be offered in the hours of 07h00 - 20h00 South African time.</p> <p>Number of installations in operation in Southern Africa- Email support to be offered with a guaranteed turnaround time of 1 business day.</p>		
<b>3</b>	<b>3000014012</b>	<p><b>TRAINING</b></p> <p>Training – service</p> <p>Product training offered in South Africa</p> <p>off-site training to be offered on date of delivery</p> <p>Local off-site presentation and demonstration</p> <p>No Fitness For Duty, FFD required</p>	<b>1</b>	



TOTAL PRICE EXC VAT		
TOTAL PRICE INCLUDING VAT		
Delivery cost		
Mode of Transport		
Lead times		
Payment terms		