TAP-4 Instrument	
	TAP-4 is a high performance, software driven data acquisition and measurement system operating under Microsoft Windows. The TAP-4 measures Vibro-Acoustic signals on OLTCs (On Line Tap Changers) while the transformer is either ON-LINE or OFF-LINE. The measurements are quick (typically less than 15 minutes) and non-intrusive. Thanks to the quick diagnostics that result from the Vibro-Acoustic Method, the typical usage of this technique is to target transformers that are due for maintenance (or candidates for maintenance). The TAP-4 easily detects the different OLTC faults and problems, especially those relating to contacts wear, arcing, drive mechanism, braking and this is mainly due to the integration of its interpretation methods and its DB-TAP, a data base of typical Vibro-Acoustic signatures of OLTCs. This Vibro-Acoustic method is recognized by two transformer maintenance standards: IEEE. PC57.143 and CIGRE A2,34. OpenZen includes the patented method for calculating envelops of the recorded Vibro-Acoustic signals, developed by Hydro Québec and marketed by Zensol under License. These envelops are at the heart of the data base DB-TAP. The first OLTC signatures in the data base were recorded 5 years ago. Today, OpenZen/DB-TAP consists of the typical reference signatures of OLTCs from the different major manufacturers (ABB, M&R Reinhausen, GE, AEG, Federal Pioneer, Ferranti Packard, Moloney, Westinghouse...). DB-TAP is in constant evolution. OpenZen Software is included with the system free of charge with unlimited updates, downloaded from our web site (in the TAP-4 customers section).

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TAP-4 Specifications

High performance: precision and resolution	• Signal Frequency range: DC to 200 kHz. • Analog to Digital conversion: 16 bits resolution (+/- 1 LSB) in less than 180 nanoseconds. • Noise level: 1 mV peak to peak (Signal to Noise Ratio: - 84 dB). • Instantaneous transfer to a PC of data recorded during a TAP change while ON-LINE (+/- one or two taps) or while OFF-LINE (on ALL taps). • Instantaneous computation and viewing of the High and Low Frequency envelops on any computer screen.
Sampling time and sampling frequency	• Sampling time: 10.000 microseconds. • Sampling frequency: 100 KHz.
Recording time	• Unlimited recording time (Only limitation is the computer's storage capacity).
Multiple Acquisition modes	• By signal TRIG START and TRIG END on any signal. • By fixed recording time (5 to 30 seconds).
Auto-test function of motor current	• Simulation of the current output of a TAP Changer Drive Motor. • Functional verification of the current clamps.
Auto-test function on Accelerometers	• Simulation of a typical vibration signal. • Functional verification of the accelerometers.
Computer Link	• Connection via a USB link to any computer running Windows 2000, XP, Vista or Windows7. • Instantaneous transfer of the data recorded during a TAP Change.
Printing	• B&W or Color printing on standard with a standard printer, connected to the computer. • Easy printing of all graphical analysis (superposition, zoom, time scale expansion and amplitude scale expansion, etc.).
Dimensions and weight	• Robust construction: casing made of reinforced polyethylene with molded-in ribs for extra protection including top and bottom covers. • True Portable unit, no extra carrying case required. • Dimensions (closed with covers on): 33x35x18 cm (13"x13.8"x7.1" in).

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	• Weight: 7 kg (15.43 lbs).

Inputs and Outputs	
1 Current Input, +/-10V, AC/DC	• Direct input for Current input AC/DC (+/-10V). • Measures the current of the TAP Changer Motor Drive, AC or DC. • Analog to Digital converters with 16-bits resolution and ultra fast conversion of less than 180 nanoseconds. • Signal to Noise Ration: equal or better than - 84 dB. • Connector: BNC.
3 ICP Accelerometer Inputs (for vibration measurement)	• Direct input for ICP accelerometer (+/-5V). • Analog to Digital converters with 16-bits resolution and ultra fast conversion of less than 180 nanoseconds. • Accelerometer excitation courant: 4.0 mA @ 24V. • Accuracy: +/- 1mV. • Frequency response: 0.7 HZ à 25 KHZ. • Range: +/- 50g, +/- 500g, +/- 1000g. • Signal to Noise Ration: - 84 dB. • Connector: BNC.
Current Clamp Test Output	• Functional verification of the current clamp. • 3 Amps.

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Software	Ease of use, Power and Flexibility
OpenZen : Test, analysis and interpretation of vibration measurement under Windows. **DB-TAP : typical OLTCs Vibro-Acoustic signatures data base** **Extensive Library of test plans for many OLTCs from the major manufacturers**	The TAP-4 is driven by OpenZen through an intuitive and very easy to use graphical interface. Thanks to the integrated tools for analysis and interpretation of Vibro-Acoustic signatures, it is possible to do an EFFICIENT and TARGETED maintenance of OLTCs and to provide a rapid intervention diagnostic. Following is a description of the general characteristics of OpenZen: • Integrated Database (DB-TAP): typical Vibro-Acoustic signatures of different OLTCs from different Manufacturers. • Complete computer control of the TAP-4 during the tests. • Instantaneous transfer of recorded data to any computer for immediate analysis. • Unlimited recording (limited only by the storage and processing power of the computer). • Instantaneous mathematical processing of received data for immediate analysis on the computer. • Integrated test plan library. • Data Export with immediate visualisation under Microsoft Word or Excel or export in XML. • Unlimited free update.
Basic Functions	• Easy standard test data input: time of test, operator name, HV substation number, circuit breaker manufacturer, serial number, inventory number, number of operations, etc. … • Tests sequence is quick (< 15 min) and automated. When the OLTC is ON-LINE, we go up and down by 1 or 2 TAPs with respect to the current one. • High and Low frequency Envelop extraction of vibro-acoustic signals from the TAP Motor Drive Current (method patented by Hydro Québec and marketed under license by Zensol). • Trends Analysis by comparing up to 20 signatures on a single graphical screen. • Timing Asynchronism analysis between TAPs. • Contact wear analysis by High and Low frequency envelop comparisons. • Signatures analysis by comparisons of EVEN or ODD, identical or different TAPs taken on the same date or on different dates, between identical or different tests for OLTCs trends analysis. • Ease of recorded data classification.

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	• Comparative analysis of signals or portions of signals from identical tests or different tests executed on same date or different dates is very useful for trends analysis. • Test plans generator.
Advanced Functions	• Test plans designer (up to 70 tests per test plan). • General information Screen Designer. • Multilingual tabular report designer. • Graphical reports Designer. • Excel reports designer. • Batch tests designer. • Specialised Mathematical processing Designer: more than 100 mathematical functions are available. These functions constitute a precious aid to the operators because they make the analysis and interpretation of the test results a very easy task.

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International Standards, Certifications and Accreditations	• Zensol is certified ISO 9001. • Accreditation: Hydro-Québec.
Optimal Conditions of use	• Environmental: 0 to 50°C. • Noisy environment in High Voltage area up to 800 kV. • Humidity: 0-95% Non Condensing. • Power input: universal auto-ranging 100 to 240 VAC 50/60 Hz +/-10%.
Accessories included	Each TAP-4 is supplied with: • OpenZen Software. • 1 Earth (or ground) cable and power supply cable. • Calibration certificate and a conformance report. • Manuals.
Recommended Accessories	• 1 Current Clamp (AC or AC/DC). • 3 ICP Accelerometers (+/-50g). • 3 cables BNC-1032 for 3 accelerometers. • 4 extension cables BNC (for 3 accelerometers and 1 current clamp). • 3 lots of 10 accelerometer mounting bases. • 3 tubes of Glue.

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