Vacuum stability tester STABIL is used for measuring chemical stability of energetic materials (explosives, propellants, pyrotechnics, reactive chemicals, explosive wastes). The apparatus measures volume of gas evolved from heating the samples in evacuated test tubes in a heating block maintained at a constant temperature (30 - 150 °C) for a specified period of time. STABIL is a fully instrumental tester equipped with sensitive electronic pressure transducers, communication with PC for direct control, continuous data acquisition, analysis and archiving. It is capable to test multiple samples (up to 20) from a single measuring unit.

In last 8 years of continuous innovations STABIL established itself as a standard equipment in many major explosives testing laboratories round the world where it fully replaced old apparatuses with mercury-containing manometer tubes, which use was highly dangerous (toxicity of spilled Hg from broken tubes), laborious and not providing continuous pressure – time record important for stability evaluation.
Applications

Vacuum stability test is frequently used for determination of chemical stability and compatibility of energetic materials and for quality tests of energetic ingredients. The test is able to discover with high sensitivity, precision and reproducibility chemical instability of energetic materials due to presence of destabilizing impurities, incompatibility with surrounding materials or ageing. Vacuum stability test finds its wide application in qualification, surveillance, manufacture, quality control and R&D of a whole range of energetic materials.

Vacuum Stability Tester STABIL is designed to comply with requirements of the following standards of testing:

- STANAG 4556: Explosives, Vacuum Stability Test
- STANAG 4147: Chemical Compatibility of Ammunition Components with Explosives (Non-Nuclear Applications)
- STANAG 4022/4, 4023, 4230, 4284 and 4566 Stability tests of energetic ingredients (RDX, PETN, HNS, HMX, CL-20)

The STABIL tester can also be used with minor modifications for other customer defined tests, such as long-term (weeks, months) stability tests at lower temperatures.

Instrument Description

Vacuum stability tester STABIL is an apparatus for determination of chemical stability of energetic materials by vacuum stability test. The apparatus uses electronic pressure transducers for measuring the volume of gas evolved on heating multiple samples in evacuated glass test tubes in a heating block maintained at a constant specified temperature for a specified period of time.

The apparatus is composed of a main unit operating 1 – 2 heating blocks, each block with 10 test tubes with pressure transducers. The main unit contains 2 temperature controllers and 2 safety (limit) temperature controllers for the heating blocks, data acquisition unit for continuous recording of signals from up to 20 pressure transducers, stabilized power supply for the transducers and a data port for communication with a personal computer. The two-way communication data acquisition unit allows the operator to set heating programs directly from the computer and separately calibrate or use each of the 20 test tubes with samples. Typical temperature of measurement is in the range of 90 – 120 °C and testing period is typically 40 – 48 hours. Data acquisition unit also processes signals from a barometric pressure transducer and a temperature sensor continuously measuring ambient pressure and temperature during the test. These ambient data are used for calculation of a volume of evolved gases from each sample under the test.
The temperature controller maintains the temperature of heating blocks to a specified isothermal temperature. It contains an independent alarm circuit switching off the heating if the temperature accidentally increases above a specified safety temperature. The heating blocks are made of aluminum and each block contains 10 holes filled with silicon oil for better heat transfer to the test tubes. Each block contains 2 independent temperature sensors (for temperature and limit controllers). Temperature in the heating blocks is controlled and corrected using calibrated mercury thermometers or by a digital temperature calibrator.

Software Winstab 3.0 Eng for Windows XP continuously records and evaluates evolution of gases from each of up to 20 test tubes heated simultaneously. The software calculates and plots volume of gases vs. time curves, contains calibration procedures for each test tube and transducer, records ambient and test temperatures and pressures, contains alarm functions detecting dangerously high decomposition rate of samples with risk of explosion during the test or deviation of a test temperature from the required value. When detecting dangerous conditions, heating of the blocks can be switched off also automatically by the software (independent on the same function of a temperature controller). From the computer it is possible to set test temperature for the heating blocks and sampling intervals of data from transducers. Temperature controller can be calibrated and corrected by the software based on data from calibrated mercury thermometers or digital temperature calibrator.

OZM Research is an experienced manufacturer of instruments for testing of energetic materials and it is able to design and manufacture a type-specific equipment according to the customer's needs. Above-described instrument is considered to be a "standard" version, any specific requirements of a customer for customized version of the vacuum stability tester are welcome.

**Main parameters**

- Temperature range: 50 – 160 °C
- Temperature control accuracy: ±0.1 °C
- Calibrated mercury thermometer accuracy: ±0.2 °C
- Digital thermometer: ±0.1 °C
- Pressure transducer range: from 0 to 100 kPa, accuracy: 0.25 %
- Barometric pressure transducer range: from 80 to 120 kPa, accuracy: 0.25 %
- Test tube volume: approx. 25 ml
- Sampling rate: 1 s⁻¹
- Minimal vacuum: 0.3 kPa
- Typical sample weight: 5g
- Material of test tubes: Simax® - a borosilicate glass with increased chemical resistance
**Standard instrument parts**

STB-MUA-20-FAE  Main unit with 2 temperature controllers, 2 limit temperature controllers and a pressure sensor for ambient conditions, for operating of 1 or 2 heating blocks

STB-HB-Ex  Heating block for 10 test tubes

STB-PT160  Piezorezistive pressure transducer 0 – 100 kPa

STB-TTEP  Test tube with an evacuation port, incl. volume calibration

STB-VP  Vacuum pump (min. pressure 0.04 Pa, flow rate 37 l.min⁻¹) with an evacuating manifold (20 valves) for test tubes

Winstab 3.0  Software Winstab 3.0 Eng for WXP

STB-accessories  evacuating manifold, test tubes holder, transucers holder, ambient sensors holder, suction hoses, cables

**Optional accessories**

STB-UTC-S  Calibrated digital thermometer incl. sensor, 0-200°C, resolution 0,1°C

STB-MT100*  Calibrated mercury thermometer, range 40 – 110 °C

STB-MT180*  Calibrated mercury thermometer, range 110 -180 °C

**Consumables**

STB-SG  Silicone grease 100g resistant up to 180°C

*Available only by land carriage

**Shipping data**

Package dimensions (W x L x H): 60 x 80 x 70 cm, 2- boxes

Package net weight: 150 kg

Package gross weight: 180 kg

Custom code: 9026 20 20
Installation requirements

Main Unit dimensions W x L x H: 290 x 460 x 110 mm, weight: 8 kg
Heating block dimensions D x L: 290 x 290 mm, weight: 30 kg
Electric power source: 230 V / 50 Hz, 360 W per one heating block
Local exhaust or a fume hood
Personal computer with Windows XP

Export license

Export of STABIL apparatus is subject to export license for military goods from the Czech Republic. The apparatus can only be exported after having received the approval of the licensing authority concerned. To apply for the valid export license, international import certificate or end-user certificate is required.