CETA® Newsletter

Dear readers,

Here is our newsletter no. 20, issued for the MOTEK 2012 trade fair. The first CETA newsletter was issued in April 2005 on the occasion of the CONTROL 2005 trade fair and this means of information has now established itself over 7 years of practice. Our CETA practical tips are particularly appreciated, inasmuch as they describe typical effects occurring in practice as well as phenomena and methods. We have taken this into account in this newsletter, which includes two practical tips. We are very happy about the positive response to our newsletter and this motivates us to continue its publication. At our stand at the MOTEK trade fair (hall 5, stand 5013), we will present some practical applications. We are looking forward to your visit.
Wishing you a pleasant reading of our new newsletter!

Yours

Günter Groß

Managing Director

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CETA exhibitor at the 3rd CONTROL CHINA 2012 in Shanghai

This year again, CETA was present at the CONTROL China 2012 trade fair in Shanghai. This trade fair has been held three times so far and CETA was represented in all three exhibitions. Our Sales Manager, Dr. Joachim Lapsien, gave a lecture on „Industrial Leak Testing“ at the technical forum of the fair. Due to the increased number of exhibitors, the fair was held this time in the Shanghai New International Exhibition Center (SNIEC) in Pudong. Our Chinese cooperation partner Dantsin supported us once more this year, both during the trade fair and the following visits to our Chinese customers and prospective customers. Our successful presence on the Chinese market is expanding, all the more so since the quality of CETA products has now gained wide recognition in China, too.

CETA practical tip 1: Conversion of the leak rate for different test gases

We are often faced in practice with the question of how to convert the leak rates (Q_L) from one gas to another. This is mainly dependent on the viscosity η. The leak rate ratio is inversely proportional to the ratio of dynamic viscosity (provided that the specific test part geometry remains unchanged):

$$\frac{Q_{L1}}{Q_{L2}} = \frac{\eta_2}{\eta_1}$$

In addition, it must be taken into account that the viscosity of gases increases with rising temperature. When the allowable leak rate is set during a test procedure to 1 ml/min for the test medium argon, this corresponds to a leak rate of 1.23 ml/min when using air as test medium and 1.28 ml/min in the case of nitrogen.
The leak rate is also often given in the unit mbar*l/s (1 mbar*l/s = 60 ml/min).

Gas	Dynamic Viscosity η
Argon (Ar)	$21.2 * 10^{-6}$ Pa*s
Helium (He)	$18.7 * 10^{-6}$ Pa*s
Carbon dioxide CO_2)	$13.7 * 10^{-6}$ Pa*s
Air	$17.2 * 10^{-6}$ Pa*s
Sulfur dioxide (SO_2)	$11.6 * 10^{-6}$ Pa*s
Nitrogen (N_2)	$16.5 * 10^{-6}$ Pa*s
Hydrogen (H_2)	$8.4 * 10^{-6}$ Pa*s

Dynamic viscosity of gases at 0°C and 1013,25 hPa

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CETA practical tip 2: Influence of the stabilization time on the C_g-value

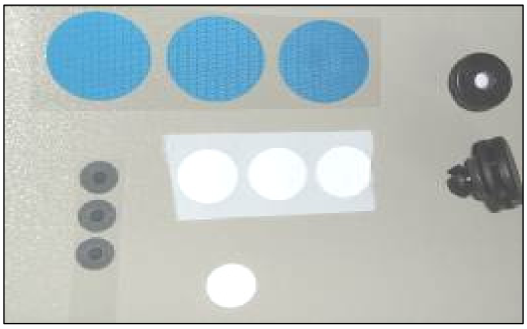
In the case of a test part which can be filled directly, the test procedure consists of the filling, stabilization, testing and venting phases. In the stabilization phase, the pressure fluctuations produced in the test part during the filling procedure should subside. When working with positive gauge pressure as test pressure, the air is adiabatically compressed during filling, which results in an increase in temperature of the gas. This change in temperature of the gas should calm down during the stabilization phase. Consequently, the stabilization phase is of great importance for the measuring process. In practice, we are often faced with the challenge of the timewise integration of the leak-testing process in the production cycle. And, since it might appear that nothing happens during the stabilization phase, the user to shorten the same. However, when doing this, the test phase will begin when disturbances are still clearly measurable. Consequently, the results of the test phase will scatter more strongly, leading to a greater standard deviation. As a result, the capability index C_g (see CETA newsletter nos. 5 and 13) will drop, since the standard deviation is used for its determination. In the course of a test series, the impact of shortening the stabilization phase on the capability index was investigated. For this purpose, a heat exchanger (inner volume 160 cm³) with allowable leak rate of 0.87 ml/min was leak-tested at a test pressure of 2 bar. A stable regime was reached with the following parameters: filling time: 3 s, stabilization time: 8 s, test time: 5 s, venting time: 1 s.

Stabilization time	8.0 s	7.0 s	6.0 s
Tolerance	33.72 Pa	32.56 Pa	32.28 Pa
Standard deviation	0.60 Pa	0.77 Pa	0.84 Pa
C_g-value	1.882	1.409	1.280

This chart clearly shows that the standard deviation increases when the stabilization time is shortened (with practically unchanged tolerance), and the C_g value decreases from 1.882 (stabilization time: 8.0 s) to 1.409 (stabilization time: 7.0 s) and 1.280 (stabilization time: 6.0 s). Shortening the stabilization time has a negative effect on the „capability“ of the test procedure.

Determination of the flow rate of compensation elements mounted in housings

A wide number of components used in the automotive branch (e.g. headlights, lamps, electronic steering boxes) are subject to the influence of



various environmental factors. For this reason, they must among other things be tested for water tightness. Increasingly, pressure compensation elements (PCE) are being used for watertight closing of the only opening of the test part, and for pressure compensation in the component during operations. For the purpose of leak testing, the test part must be filled with compressed air through this membrane. Besides leak-testing of the housing, it is also necessary to detect reliably any membrane defects. Occasionally, it is required to determine the flow through the built-in membrane. In this case, we have the following problem: Since the flow tester fills up the test part during the flow testing process, the measured flow decreases continuously due to the increasing counterpressure. This makes it difficult to obtain reliable metrological evidence of the condition of the membrane. By evaluation of the time course of the flow, it is possible to determine the flow of the membrane as if it was subject to a free flow to atmosphere. This value is displayed as test result.
This function is available as option for the flow tester series CETATEST 915.