DATASHEET FLOW CONTROL FOR LEAKAGE TEST A053

APPLICATION NOTE

Flow control used for leakage test of air ducts

Using Pressure Controllers & Mass Flow Meters

In the heating, ventilation and air conditioning sector it is important that exhaust pipes of central heating systems do not leak combustion gases. Also, air ducts installed in buildings have to be airtight to some extent. Bronkhorst supported customers in this sector by supplying a leakage test method using flow meters combined with pressure controllers working as a '**device under test**' principle to guarantee **leak tightness** and **temperature stabilitsation**.

The test can be applied to closed systems as well as open systems, temperatures and high pressures, to make the reaction steps as effective as possible and it is related to quality control: more and more ISO certifications require the documentation of quantitative leakage data.

Application requirements

The basic principle is simple: consider a '**device under test**', which may be everything, ranging from a small hole to a volume of 10 liters. Apply a pressure by using a pressure controller, and measure the gas leakage using a gas mass flow meter. The use of the specific pressure controller and gas flow meter depends on the setting and measuring range.

Important topics

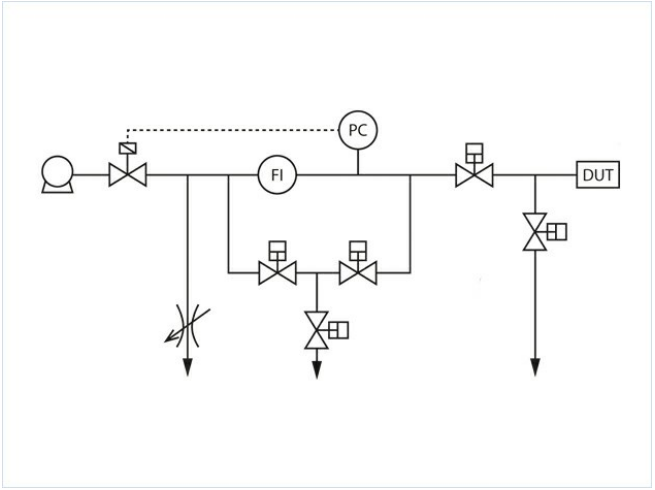
- Test to check or guarantee leak tightness
- Temperature stabilisation

Process solution for leakage test

A practical realisation of the measuring principle is as follows: Place the **device under test** (DUT) below a certain gas pressure as specified by the customer. The 'leakage rate' under that specific condition has to be known. Suppose this initial pressure is 5 bars, then we need to know what incoming flow is necessary to balance the outgoing leakage, in order to keep the pressure stable.

A pressure controller sets the pressure and the gas flow is measured by a thermal mass flow meter. Even a liquid-related application can be tested in this way by performing gas flow measurements. In the case of testing air ducts, we use *pressurised air* delivered by the customer's compressor. *Normal air* can be used as well, when water and oil have been removed prior to testing.

However, there are some catches. In order to eliminate the pressure drop over the mass flow meter, the pressure controller needs to be as close to the **device under test** (DUT) as possible. This means the pressure controller and its valve need to be separated physically.



Flow scheme

It is very common to test multiple DUT's in succession. To reduce the testing time and to improve the stability of the test, two shut-off valves are placed between the setting/measuring equipment and the DUT. Especially for cases with a very small leakage rate, a safe bypass has to be added to the setup in order to fill the DUT quickly. Using such a safe bypass avoids approving a defect product. The solutions to all these 'catches' are shown in the flow scheme.

Temperature stabilisation prior to conducting a measurement is essential. For example, due to gas expansion a temperature variation of 2 °C already results in a volume change of 0.7 %. Any leaks smaller that this volume change cannot be measured when the temperature fluctuates.

Recommended Products

EL-FLOW SELECT F-112AC

Min. flow 0,8…40 ln/min
Max. flow 1,4…250 ln/min

Pressure rating 100 bar

Compact design

High accuracy

MASS-STREAM D-6360 MFM

Min. flow 0,4…20 ln/min
Max. flow 2…200 ln/min

Pressure rating up to 20 bar

Rugged sensor and housing (IP65)

Optional integrated TFT display

EL-PRESS P-702CV (P1-CONTROL)

Min. pressure 20...100 mbar
Max. pressure 12,8...64 bar

Absolute or gauge pressure

High accuracy

E-8000 SERIES

Digital Readout / Control Systems

Bright, wide angle, 1.8" display (TFT technology)

User friendly operation, menu driven with 4 push buttons

Bronkhorst®

BRONKHORST (UK) LTD

1 Kings Court

Willie Snaith Road

Newmarket Suffolk CB8 7TG

Tel. +44 1223 833222

sales@bronkhorst.co.uk