CONTURA Z 2

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LEAK TESTING OF
FLEXIBLE PACKAGES

LDS SYSTEMTECHNIK

CONTURA Z²

LEAK TESTING OF FLEXIBLE PACKAGES

SUITABLE PRODUCTS

Packaging of the product is of prime importance in the foodstuff, pharmaceutical and medical device industry. Of the many requirements that a product package must meet, leaktightness merits special emphasis. In the case of packages under modified atmosphere, for example, a gas exchange must absolutely be avoided in order to preserve product quality. In the case of vacuum packages any rise in pressure (air pullers) or ingress of atmospheric oxygen is undesirable. Current testing methods are unsatisfactory, because of the inadequate display of their results, their handling requirements, their cost and, above all, their detection limits. LDS sets a new standard with the compelling benefits offered by CONTURA Z² leak tester.

TYPICAL LEAK TYPES

Despite the variety of products, package types, packaging techniques and package materials, leaks derive from just a few causes:

- Product on the sealing seam
- Seal parameters out of tolerance
- Film/Foil damaged during deep drawing
- Film/Foil punctured by the product
- Wrinkles in the sealing seam

The leaks caused by these defects range from obvious macrodamage down to microleaks whose effect is not known before the product reaches the consumer.

HOW LEAKTIGHT IS LEAKTIGHT?

A package has to be leaktight!
That is a basic requirement that must be met by many packages. Upon precise analysis of the engineering and physical relationships, however, it becomes clear that leaktightness is not a digital state represented by "leaktight/leaky" but encompasses a broad spectrum of possibilities.

The theoretical lower limit of "leaktight" is in practice unattainable. Instead, it makes sense to establish a testable specification that meets the requirements determined by the particular product. The unit [mbar l/s] is used as a measure of the size of a leak. 1 mbar l/s corresponds to a pressure change of 1 mbar per second in a container whose volume is 1 liter.

Variation	**mbar l/s**
1 mbar, 1 liter, 1 sec	$1 = 10^{0}$
1 mbar, **0.1 liter**, 1 sec	$0.1 = 10^{-1}$
1 mbar, 0.1 liter, **100 sec**	$0.001 = 10^{-3}$
0.01 mbar, 0.1 liter, 100 sec	$0.00001 = 10^{-5}$

Typical leak types are then associated with the following leak sizes:

	mbar l/s	Detection limit
Watertight (drops)	10^{-2}	
Vaportight (sweating)	10^{-3}	water bubble bath
Bacteria-tight	10^{-4}	
Gasoline- and oiltight	10^{-5}	
Virus-tight	10^{-6}	
	10^{-8}	CONTURA Z²
Absolutely (technically) leaktight	10^{-10}	

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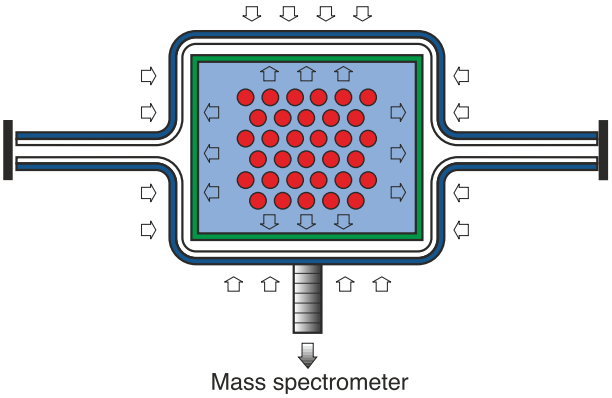
MEMBRANE CHAMBER PRINCIPLE

The detection limit of < 10^{-8} mbar l/s of the CONTURA Z² is achievable only by means of a mass spectrometric analysis with a test gas.

However, if sensitive flexible packages are subjected to such a pressure difference, the sealing seams could be so severely strained that the package may even burst open. Such loading is precluded by the patented membrane chamber principle used in the CONTURA Z².



FUNCTION

The product to be tested is placed manually or automatically onto the bottom membrane. When the lid is closed, the test sequence is initiated automatically. During the evacuation, the pressure of the atmosphere presses the highly elastic membranes against the package, and the product's contour is clearly outlined. The internal pressure of the package braces the film securely from the inside, resulting in a force equilibrium (internal pressure of the package = atmospheric pressure) which does not exert any load on the sealing seams. The test now proceeds under vacuum without any deforming or inflating of the package. Any test gas that emerges as the result of a leak is detected and quantified in the mass spectrometer (ref. ASTM 493, method B). The test result indicates the amount of leaktightness but not the location of a leak.

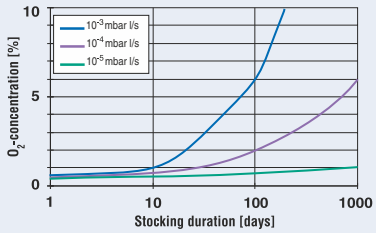
LEAK LOCALIZATION

The critical points of the package can be explored with the standard sniffer probe. The locations of leaks in the package are thereby precisely determined (ref. ASTM 499).

HELIUM AS TEST GAS

The noble gas helium (E989) used as a tracer gas is ideally suited for leak testing.

Rise in oxygen concentration due to leaks



Based on a residual oxygen concentration of 0.5% in a package - immediately after it has been sealed - the oxygen concentration will rise depending on the duration it remains in stock and the size of the leak:

- Inert gas, hence completely neutral and no deleterious effect on the product
- Excellent detection in the mass spectrometer
- Present at only 5 ppm in the atmosphere
- Easy to handle
- Permitted without limit as an additive to foodstuffs

Its low concentration in the atmosphere and its precisely definable concentration in the test object make helium superior to any other test gas.

The detection limit is about 1,000 times lower than for CO2 and about 10,000 times lower than for N2.The test gas can be injected together with the protective gas. The required helium concentration in the package is only about 3 to 6%.

PRESENTATION OF THE TEST RESULTS

For easy and comfortable operation, the Contura Z² is outfitted with a multicolor 7" Touchscreen.

The test result is presented as a value of the leak rate, a bar-graph and as a PASS/FAIL signal indicated by a Green/Red signal lamp. This ensures objective test result independent of the operator. The expert and the setup mode are also indicated by an amber illumination of the signal lamp.

With the implemented standard touchscreen software, setup and expert mode tasks can be performed easily. Test results can be stored in the system and accessed via USB for further processing. This allowes to automatically generate a complete documentation of test results.

QUALITY CONTROL LOOP

The leak-testing methods in widest use today permit only a PASS/FAIL analysis of the individual product but cannot determine the exact size of a leak.

For example, temperature changes in a sealing tool cannot be recognized until the product has been sorted out in a test. But by then it is too late to be able to prevent rejects.

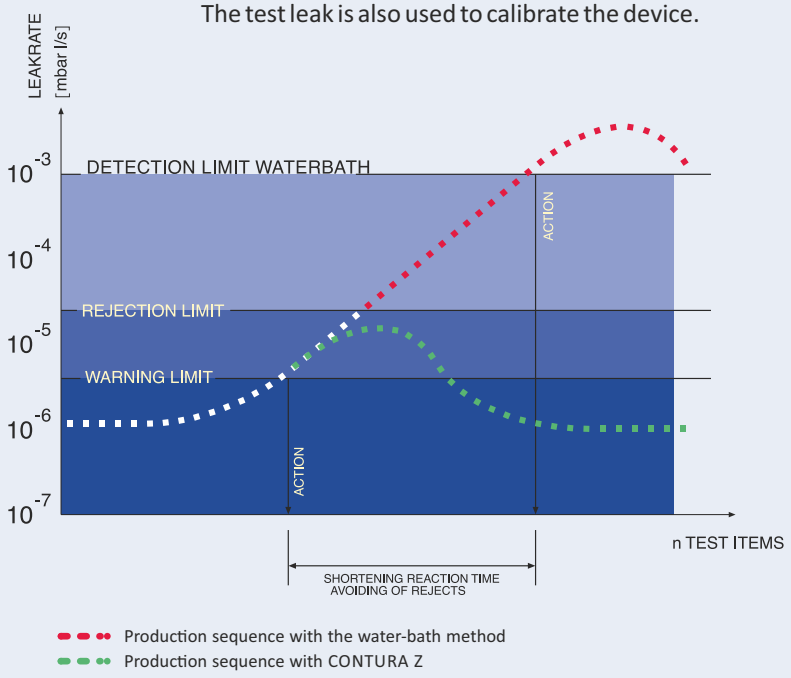
Thanks to the unmatched detection limit of the CONTURA Z², leak rates well below the rejection or warning limit can now also be monitored.

Even the tiniest insidious changes in leaktightness - such as those caused by a temperature change of the sealing tool for example - can be detected early enough to enable corrective measures to be initiated.

The effectiveness of such measures is then directly observable.

The quality of the entire packaging process can then be monitored by means of statistical process control. The accuracy of the CONTURA Z² can be checked at any time with a calibrated test leak.

The test leak is also used to calibrate the device.



CONTURA Z®

FEATURES

BENEFITS

FEATURES	BENEFITS
Testing in the membrane chamber	Non-destructive, stress-free testing Immediate result (15 sec.) No specific package fixture required
Testing under vacuum, helium test gas	Detection of ultrasmall leak rates Qualification of film and foil material
Leak location down to the millimeter	Immediate determination of the critical points on the package
Trend detection and statistical process control	Closed quality-control loop Corrective measures before rejection Possibility of inferring the current process parameters
Electronic data acquisition and processing	Document exit tests (ISO 900x) Data logging standard, USB access
Optical indication of test results	Objective test result independent of the operator
Simultaneous testing of several different products	Simultaneous monitoring of several product lines is possible (no conversion)
Individual or group testing	Random-sample testing of up to 100%, depending on the production speed
Introduction of the test gas (a few % helium) together with the protective gas	Simple connection and metering via gas mixer

ACCESSORIES:

Calibrated test leak

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TECHNICAL DATA

Smallest detectable leak rate		
Automatic test sequence, test cycle duration approx. 15 s	mbar l/s	$< 10^{-7}$
Continuous testing	mbar l/s	$< 10^{-8}$
Leak localization with sniffer probe	mbar l/s	$< 10^{-6}$
Test cycle duration		
Base setting	s	approx. 15
Continuous measurement (adjustable)	s	up to 999
Expert Mode (no automatic cycle)	s	∞
Outputs		Data logging (.csv) to USB
Usable diameter of membrane chamber		
up to a product height of 20 mm	mm	700
up to a product height of 100 mm	mm	500
Maximum product size		
up to a product height of 20 mm	mm	400 x 400 / 250 x 500
up to a product height of 100 mm	mm	350 x 350 / 250 x 400
Power supply, one-phase		230 V ± 5 %, 50 Hz
Power consumption	kVA	2.3
Dimensions	mm	800 x 1133 x 1130
Weight	kg	ca. 350
Ramp-up time (after start-up)	min	< 3

ORDERING INFORMATION

CONTURA Z leak testing unit	EURO	230 V /50 Hz	Cat. No. CZ2-2W4S-15XA
Calibrated test leak			upon request
Maintenance kit			upon request

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