Recovery and Relaxation Measurement of Very Soft Viscoelastic Foams

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- **Instant release of the hold force even with very soft viscoelastic foams**
- **Highly reproducible measurements of the recovery time**
- **Low magnetic remanence and light weight pressure plates**
- **Patent no. 10252211**

The established test method for measuring the recovery and relaxation properties of viscoelastic foams is to compress a foam sample of defined dimensions by means of a pressure plate to a certain adjustable thickness, usually 25% of its initial size. *Format* Messtechnik GmbH has introduced the patented device Resimat®, with electromagnets holding the pressure plate at a defined compression. The foam sample is kept strained for a preselected hold time while a force gauge measures the relaxation of the compressed foam. At the end of the hold time the electromagnets are switched off and the sample gradually recovers from the deformation, regaining its original shape. A contactless distance sensor positioned above the pressure plate continuously records the movement of the sample surface (Fig. 1). On testing very soft viscoelastic foams with a compression stress value CV_{40} below 30 hPa, it may occur that the pressure plate is not instantly released from the electromagnets due to magnetic remanence of the round metal blanks. For very soft viscoelastic foams the mass of the pressure plate has an influence on the acceleration and thus the recovery speed of the foam sample. Due to inhomogeneities it may happen that the sample recovers asymmetrically. In this case thickness measurement is difficult. Especially for very soft viscoelastic foams the restoring force during compression can be rather low (Fig. 2) requiring extra high force resolution.

To overcome these problems, *Format* Messtechnik GmbH has designed a new pressure plate generation named **LMR** (**L**ow **M**agnetic **R**emanence). These plates (Fig. 5) have special round metal blanks providing a much lower magnetic remanence with only slightly reduced magnetic hold force. Even with very soft viscoelastic foams, the round metal blanks of the LMR pressure plates release immediately from the electromagnets after the hold time (Fig. 2). This happens simultaneously from up to 4 magnets. In addition, a thin (2mm), light weight pressure plate has been introduced for testing according to the IKEA® test norm IOS-MAT -0076 (Fig. 3). A new Resimat® hardware generation type 287 (Fig. 4) has been developed. Compared to the previous product generation it comprises new measuring technology, providing higher resolution of the restoring force during compression. On top of this, the distance measurement device has been replaced by the new ultrasonic distance sensor LR4, providing stable foam height readings, even if the foam sample is not recovering symmetrically due to inhomogeneities. The new measurement technology Resimat® type 287 for testing the recovery and relaxation of very soft viscoelastic foams is easy to use and can be applied for development and quality control. Beyond this it can also be used for testing conventional viscoelastic foams.

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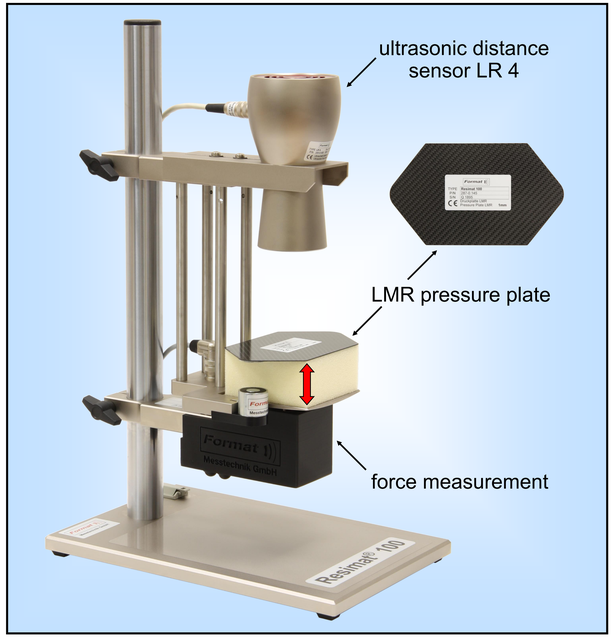

Fig. 1: Mechanical setup of Resimat® 100 of the latest type 287. It enables viscoelastic foam testing of samples 100x100x50mm³. The ultrasonic distance sensor LR 4 measures the time dependent thickness H. The new 1mm LMR pressure plate is made for very soft viscoelastic foams.

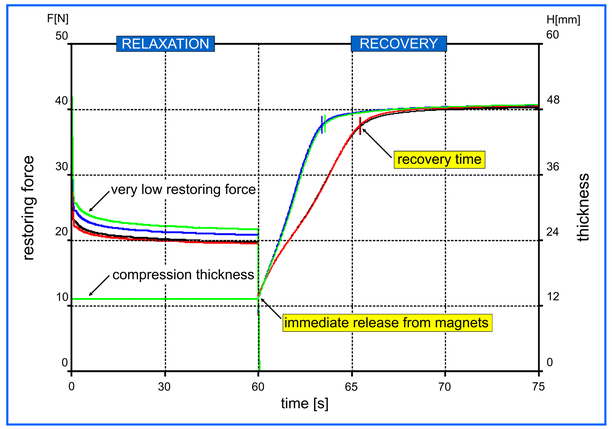

Fig. 2: Graphical overlay of three Resimat® 100 test results measured with the 1mm LMR pressure plate. The decreasing restoring force (F) shows the relaxation of the sample. The thickness curves (H) show the free recovery. The light pressure plate is made of carbon fiber.

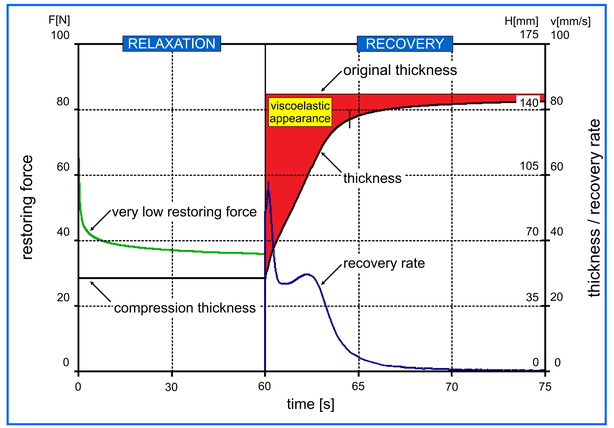

Fig. 3: Resimat® 150 measurement of a very flexible viscoelastic foam sample using an LMR pressure plate. The recovery time according to IOS-MAT-0076, is the time needed to regain 90% of the original shape after a 75% compression lasting 60 seconds. The red area shows the “viscoelastic appearance”.

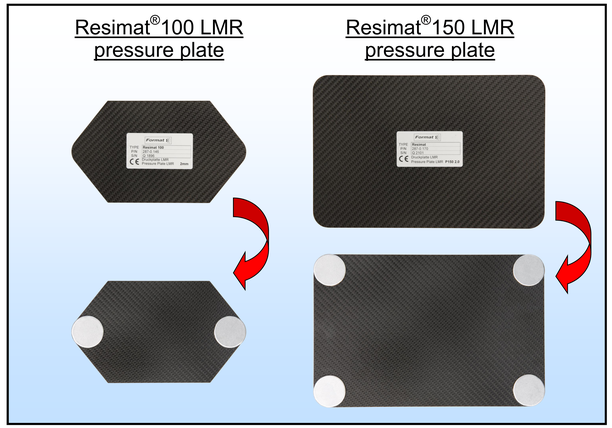

Fig. 5: The lightweight carbon fiber pressure plates of Resimat® 100 and Resimat® 150 have round metal blanks with low magnetic remanence. They release instantly and simultaneously from the electromagnets after the software controlled hold time.

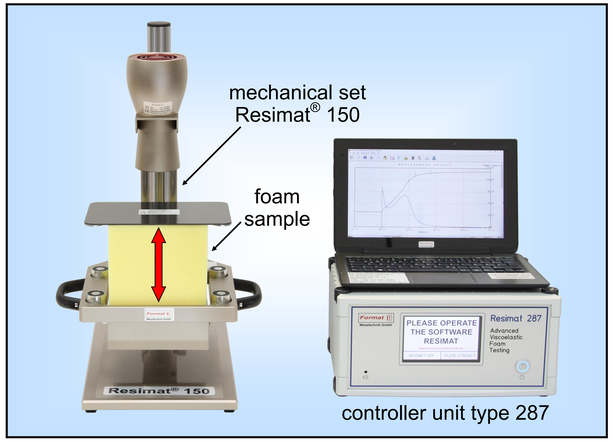

Fig. 4: Resimat® 150 (left) is designed to measure the recovery time of viscoelastic foams according to the IKEA® specification IOS-MAT-0076. The cubic test samples have an edge length of 150 mm. The controller unit of the latest type 287 provides high digital resolution.