THE SECRET OF LONG-TERM TIGHTNESS
GEMÜ DIAPHRAGM CODE 5M

Today we are searching for the secret of the long-term tightness of the GEMÜ code 5M diaphragm. What is the reason why the GEMÜ diaphragm Code 5M practically never need to be re tightened?

To accomplish this, we will consider below in the following the individual features of the GEMÜ 5M diaphragm and will discover, which parameters are responsible for its particular properties.

Is the threaded pin travel stop perhaps responsible for the high level of long-term tightness?

The GEMÜ code 5M diaphragm travel stop (see Fig. 1) offers the advantage of a defined mounting. This means that the diaphragm cannot be screwed in too little or too far, due to its defined mounting point.

Figure 1 Travel stop

Or is chambering responsible for the high level of long-term tightness of the code 5M diaphragm?

The additional chambering on the diaphragm face and the diaphragm backing (see Fig. 2) prevent the diaphragm face pulling into the centre during vacuum applications. The chambering also provides a fixed seat for the diaphragm face in the backing. This prevents the diaphragm slipping during assembly.

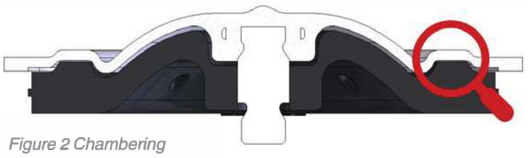

Figure 2 Chambering

Could the optimized sealing surfaceforce transfer, which acts specifically on the sealing edges, be responsible for the high level of long-term tightness?

Yes! Due to optimized geometry, the force transfer acts directly on the sealing edges of the diaphragm (see Fig. 3). This increases the long-term tightness. The compression of the compressor is channelled directly over contours on the backing diaphragm and diaphragm face to the sealing edge (see Figure 4). We are expecting to find even more properties of the GEMÜ code 5M diaphragm which are responsible for the high level of long-term tightness, and are continuing our search.

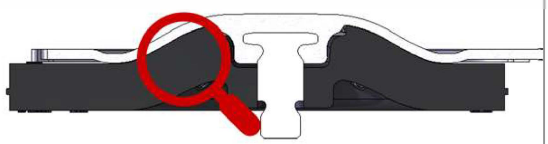

Figure 3 Optimized force transfer

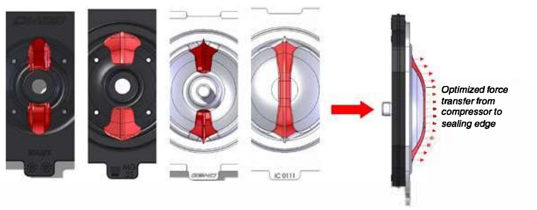

Figure 4 Optimized geometry for force transfer

Is the optimized and reinforced design of the seal contour and seal height of the GEMÜ code 5M diaphragm responsible for the long-term tightness?

Yes! The wide design of the seal contour (see Figure 5) is advantageous in terms of contact stress of the diaphragm and therefore also for the long-term tightness of the GEMÜ code 5M diaphragm. This enables consistent sealing over the valve seat and consistent external sealing. This prevents there being any dead space, in which media could collect. In addition, the reinforced sealing edges provide increased clearance during assembly and application of the diaphragm. The sealing edge of the diaphragm and valve body are always flush and must therefore be compressed together necessarily. We are expecting to find more properties of the GEMÜ code 5M diaphragm which are responsible for the high level of long-term tightness, and are continuing our search.

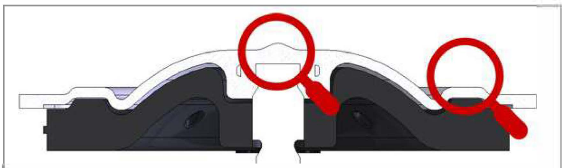

Figure 5 Optimized, wide design seal contour

Could it be possible that the high seal height of the backing diaphragm is responsible for long-term tightness of the GEMÜ code 5M diaphragm?

Yes! The seal height (see Figure 6) is the main feature of the high level of long-term tightness. The operating window, in which the diaphragm tightness holds, increases. For applications in accordance with examination in accordance with ASME BPE, the diaphragm must not be re tightened in use.

Figure 6 High sealing height

This results from the geometry of the backing diaphragm. If the backing diaphragm is considered an elastomer spring, this can explain the clear advantage in terms of the long-term tightness. Elastomer springs behave as follows: As the travel increases, the force required to move the spring also increases. If the spring is released, the force falls again. The force at the sealing area and therefore also the contact stress, which is responsible for the sealing effect, is consequently directly dependent on the spring travel of the backing diaphragm. This behaviour is also reflected during assembly of a diaphragm. Here the diaphragm is compressed and is considered as a spring with the aid of the appropriate model.

Due to the decompression effects and the consequent contact stress relaxation of the elastomer, the sealing capability of diaphragms falls during application of diaphragms. The spring travel of the GEMÜ diaphragm Code 5M extends the operating window significantly and thereby ensures adequate contact stress, in order to ensure the tightness of the valve.

The circumstances explained should be illustrated again in Figure 7. The left part shows a model, illustrating the seal components (black) of a GEMÜ code 5M diaphragm and those of an optional competitor's diaphragm. The area shown in blue is the seal partner. In the model, for the two seal components under consideration, contact surface A and spring force F are constant. The spring travel of the GEMÜ code 5M diaphragm is higher than on conventional diaphragms. In the right-hand graph, the contact stress resulting from the force and the seal surface, is shown by spring travel x. It can be seen in the graph that the operating window of the GEMÜ code 5M diaphragm features a longer spring travel, which ensures that a stress level can be maintained over a longer travel. The operating window is also longer.

As shown, the GEMÜ code 5M diaphragm has many advantages and innovative features. The most outstanding of which is the high level of long-term tightness of the diaphragm, resulting from the reasons listed above and its geometric features.

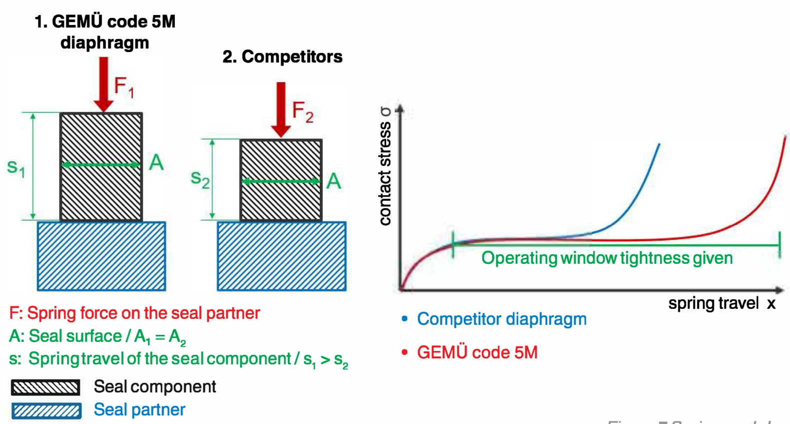

Figure 7 Springmodel