

# Leak-tightness and technical cleanliness in screw fastenings

Technical cleanliness is a quality characteristic that is gaining increasingly in importance. When it comes to electromobility, the relationship between technical cleanliness and leak tightness plays a crucial role in the reliable performance of fastenings.

Image 1: Leak-tight and cleanliness analyses often focus on leak-proof applications such as battery cases, final assembly and installations.  
(Image: ARNOLD UMFORMTECHNIK)



Clean and tight - this essential technical relationship is the basis for leak-tight fastening solutions such as are required in the electric vehicle sector. ARNOLD UMFORMTECHNIK investigates the fundamentals required to guarantee

leak-tightness and cleanliness, specifies applications, and analyses the factors that influence the system. ARNOLD UMFORMTECHNIK has been active in technical cleanliness for many years now and was pretty much the pioneer

in this field. The fastening solutions manufacturer, based in Forchtenberg, south-west Germany, believes that it is important to create an awareness that a certain requirement for leak-tightness also requires a defined degree of clean-



Image 2: ARNOLD UMFORMTECHNIK boasts two leak-tightness test stands measuring leaks with test gas, as well as another leak-tightness test stand that uses water as its test medium, and which can produce an IPX7 certificate.  
(Image: ARNOLD UMFORMTECHNIK)

liness.

### Technical cleanliness requirements

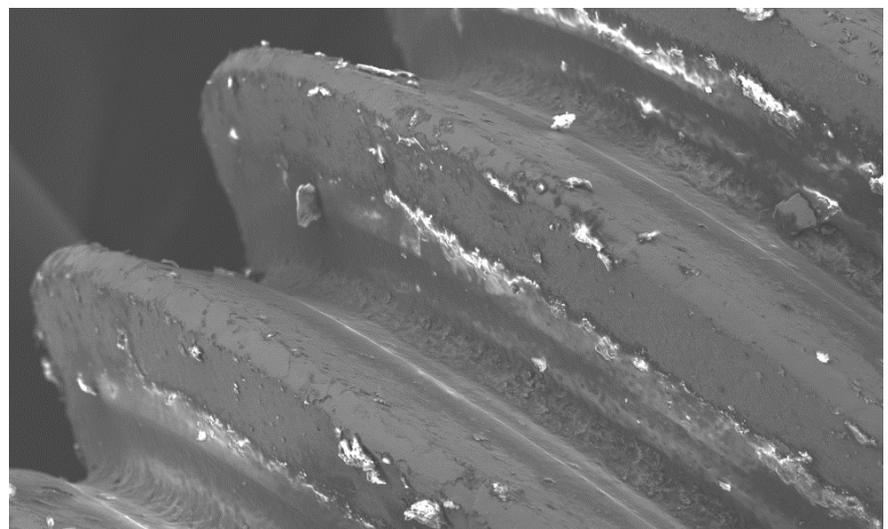
The requirements for technical cleanliness were first set by the automotive industry. Today, general regulations establish a standardised framework to achieve technical cleanliness. These include VDA19.1 for testing technical cleanliness, VDA 19.2 for technical cleanliness in assembly; then there is ISO 16.2.3.2, as well as a guide to technical cleanliness for the electronics

industry published by the ZVEI [German Association of Electrical and Digital Industries].

ARNOLD UMFORMTECHNIK has a comprehensive range of instrumentation to analyse leak-tightness and technical cleanliness. The company boasts two leak-tightness test benches that use test gas to measure leaks, a mass spectrometer that uses helium as its test medium, and a differential pressure method, using air as its test medium. Added to

the above another leak test bench uses water as its test medium and can additionally produce an IPX7 certificate. For the cleanliness analysis it is important to determine the specific particle load present. At ARNOLD, contaminating particles are detached and gathered up inside an extraction cabinet. There are several different ways of making the necessary analysis that follows. For example, the part can be analysed under an optical microscope used to

Image 3: ARNOLD has recently acquired a scanning electron microscope. This can determine the chemical elements that make up a contaminating particle. It can also draw conclusions about the source of error.  
(Image: ARNOLD UMFORMTECHNIK)

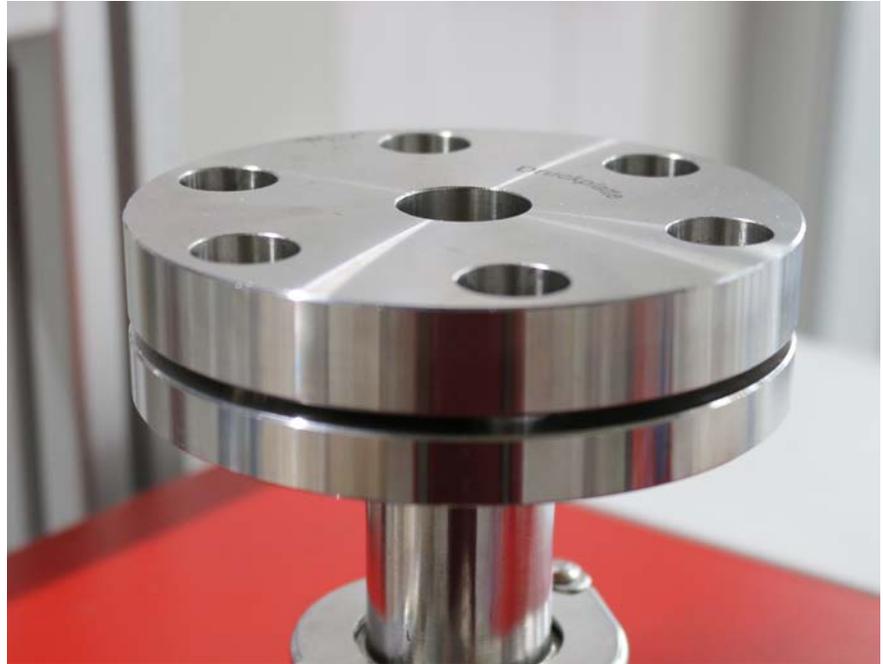


determine the length and width of any contaminating particles, and these can be categorised as metallic bright or non-metallic bright. Laboratory scales can provide information on particle mass. ARNOLD has recently acquired a scanning electron microscope. This can determine the chemical elements that make up a contaminating particle. It can also draw conclusions about the source of error. Moreover, the company has a residual magnetism test stand.

### Solutions for individual customer applications

The “clean and tight” theme plays an important role for many fasteners. Here the focus is on leak-tight applications such as battery cases, final assembly and installation. It is also very important for the electronics industry, for example when conductor tracks are set close to one another. Clean fasteners are absolutely essential when used in any oil-conducting systems as well as for the sensor technology in autonomous vehicles. Complex multi-functional and multi-stage components - such as those produced by ARNOLD's Conform Next process - can also be included into these cleanliness analyses.

The aim of the 'clean and tight' analyses at ARNOLD UMFORMTECHNIK is to guarantee a reliable evaluation of the leak-tightness of the fasteners within the context of the customer's application. As well as ascertaining how leak-proof a component is, the analysis should also include long-term effects such as



(Image: ARNOLD UMFORMTECHNIK)

corrosion or environmental influence. From all these analyses it is possible to derive a result as to which fastening solutions will meet what leak-tightness requirements. The Cleancon<sup>®</sup> concept developed and patented by ARNOLD guarantees technical cleanliness throughout every step of the process.

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