

Details with the Storage of lead-free Components

To avoid problems with micro cracks and delaminating with the processing of electronic components it is necessary to take an adequate storage into account. Since the introduction of lead-free soldering and higher processing temperatures involved the consequent vapor pressure within the components increased considerably (up to 30 bars).

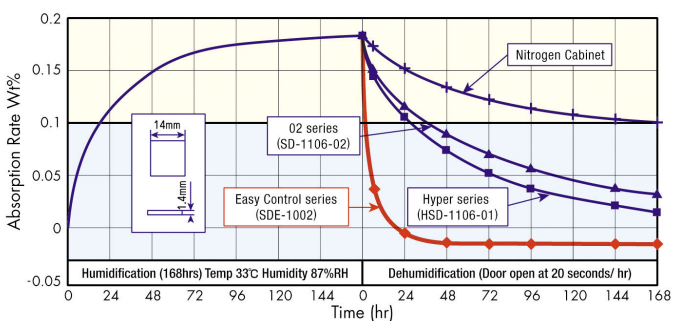
Manufacturers deliver these sensitive components in effective protection packaging to avoid absorption of humidity during transport and storage. After opening the package the time begins in which the components absorb humidity. Dependent on humidity and temperature the components can be used only within a limited time period. This time period is classified by the IPC-J-Std 033A. When a component has exceeded the allowed time the humidity can be decreased through a baking process, after which the component should be processed immediately.

A repeated absorption of humidity must be avoided because the baking process should be applied only once. The main reason is the corrosion percentage which increases along with the temperature, and because of this an increasing non wet ability of the connection surfaces arises. To fight this well-known effect many suppliers of drying ovens provide an extra elimination of oxygen by forming a nitrogen atmosphere and respectively also a vacuum during the drying process. Setting the clock back to zero for the component takes a very long time, inevitably bringing along considerable costs for nitrogen, for only a low rest-oxygen content of less than 13 ppm stops the oxidation.

Because of the considerably higher content of tin in the lead-free soldering alloys the need to protect from oxidation with the storage of components is becoming more and more important. This is caused by higher oxidation percentage of these alloys and the originally worse wet ability and flow properties of lead-free soldering alloys.

The oxygen required for the oxidation stems from two different sources. The first is the oxygen molecule O_2 , found world-wide in our atmosphere. However, because of its atomic bond it only occurs at temperatures higher than $40^\circ C$. The second and in fact more aggressive bearer of oxygen is the water molecule H_2O . The oxygen atom is only weakly connected, a considerable oxidation percentage can already be observed at low temperatures. This means that not the content of oxygen, far more the content of humidity is decisive for the oxidation percentage in stored components. Technically it is possible to solve both problems at the same time. However it is important to avoid heating above $40^\circ C$ thereby eliminating the air-oxygen as reaction partner, and to provide a strong dehumidification of the air at the same time. To achieve this dry storage systems have been made that work with a content of only 1% RH humidity. Only by this extremely low content of humidity it is possible to protect not only the components against extra absorption of humidity but also to remove the humidity already absorbed in the packaging of the components.

As the diagram shows even storage in very clean nitrogen does not provide dehumidification of components under 0.1 Wt % is not possible.



For the speed of diffusion with the drying of components the difference of concentration and the temperature are decisive. Only the Super-Dry Technology with Zeolite dryer is capable to achieve this low rest-humidity at 1% RH generating an effective drying of components at room temperature. Components stored in drying cabinets with Super-Dry technology are definitely always dehumidified and prepared to be processed. Owing to an oxidation protection which takes place at the same time longer periods of storage are no problem anymore.

The safeguarding of the quality in the production of electronics already starts with the storage of components!