WE-Standard 1581: Conditioning of Snap Ferrites

Company:
Würth Elektronik eiSos GmbH & Co.KG

Autor:
NFi

Date: 26.07.2017

Revision: 3.1

Kind of Product	WE-Star Series and WE-Snap Series
Manufacturer	Würth Elektronik eiSos GmbH & Co. KG EMC & Inductive Solutions Max-Eyth-Str. 1 74638 Waldenburg Germany

Contents

1.JEDEC Definition of Moisture Sensitivity Level (MSL)

1.1 Basis of MSL

Plastic-coated SMD components are not hermetically sealed, so moisture from the air can diffuse into the plastic. If moisture-bearing components are soldered onto circuit boards using reflow solders, this can result in the so-called "popcorn effect." The enclosed moisture vaporizes abruptly when heated (soldering temperatures up to more than 200° C). Vaporized liquid requires more space and can crack the components. The manufacturer of SMD components uses the MSL to indicate how these components should be stored and then processed.

Components are first completely dried out to determine the MSL. Then they are loaded with a specific amount of moisture and subjected to one or multiple reflow soldering procedures. Electric measurements or inspection methods (e.g. ultrasonic) afterwards check, if the components have withstood the soldering without damage. The component is considered to be workable if it is not damaged when soldered within the specified periods.

1.2 MSL with snap ferrites?

Snap ferrites are **not subject** to “Moisture Sensitivity Level (MSL)”. The JEDEC definition of MSL is completely unrelated. **Quite the contrary:** the snap ferrites packaging will ensure that the required moisture content in the plastic material will be maintained.

1.3 Maintaining moisture content

The moisture content of snap ferrites is maintained primarily until the snap ferrite will be closed/assembled **for the first time**! In this moment the plastic material will be bended to its maximum stretch. For this maximum stretch the flexibility of the plastic material is very important. The flexibility of the plastic material will be participated by its moisture content.

After the snap ferrite has been closed for the first time, it is **no longer** necessary to protect it against external climatic conditions.

Conclusion: The moisture content has an important function, so it needs to be kept until the first time closing/assembling.

2.Mechanical Properties of Snap Ferrites

2.1 Flame retardant polyamides – water content determines properties

Snap ferrite housings are manufactured from a polyamide 66/6 (PA 66/6) with a high content of flame retardant additive (Reach & RoHS compliant, halogen-free).

- The mechanical properties of this material are participated by the water content e.g. stiffness, strength, robustness and flexibility.
- Robustness and flexibility are the most important properties for the hinges.
- This two properties are impaired by the flame retardant additive. It will make the material - especially the hinges - brittle. But this flame retardant additive is required to receive its flammability classification of V0 following UL.
- Maintaining ideal moisture content of the plastic housings counteracts the brittleness process by the flame retardant additive and thus retains flexibility.
- The ideal moisture content is between **1.5** and **2.0** percent.

For this reason components pass a conditioning process after production process in which the plastic can absorb the required amount of water and achieve the ideal level of robustness and flexibility. This process of water absorption is reversible, so the plastic emits the moisture again under certain climatic conditions.

Caution: Winter months, in particular, can have a strong impact on the moisture balance of the plastic housings if they are stored unprotected, for the following reason:

"Assume you open a window to let in the chilly outside air, close it again and turn on your heat. What happens? First, the radiator will warm up the air, but the air will also feel increasingly dry at the same time. This is not because the water is lost – air contains the same amount of water whether it's warm or cold. But warm air can absorb much more water. The result is that the moisture vaporizes more quickly and gives you dry hands."

Plastic in the snap ferrites acts like your hands. It must emit its moisture into the warm air, which can increase brittleness in the area of the hinges and create risk of breakage.

2.2 Error occurrence and reliability of Snap Ferrite

Once closed, the snap ferrite with an undamaged hinge will remain in the desired position. By closing the snap ferrite for the first time, the hinge will be bent and stretched to its necessary maximum. For this process of stretching the material property of flexibility is very important. This flexibility will be adjusted by the conditioning process the parts are running through during the production process.

Conclusion: If the hinge doesn’t crack in the moment of assembly, there is no further risk of it cracking on the cable in assembled status. This is due to the maximum bend stress exerted on the hinge when it will be closed for the first time. If the snap ferrite would be taken off and assembled again, the bend stress exerted on the hinge will be less than at the first time closing!

2.3 In-house storage tests

The laws of thermodynamics says: concentrations (partial pressures) of water molecules in the air and plastic are necessarily in balance. Increasing the temperature makes it possible for air to absorb more moisture. The result is that water can diffuse out from the plastic.

Due to this In-house storage tests with extreme environmental conditions were simulated to investigate the mechanical properties of the used plastic material. Snap ferrites were subject to extreme storage conditions in a climate chamber in order to see the effects on the plastic housing.

Test conditions: Temperature: 30°C | Humidity: ≤10% | Duration: 31 days

Test result: The mechanical functionality of the hinge **cannot** be guaranteed after storing the unprotected under such extreme storage conditions!

3.Packaging for snap ferrites at WE eiSos

Due to the results of the In-house test, new packaging requirements introduced a sealable packaging solution in 2011 to provide lasting protection for the plastic housings. The air-tight sealing of this bag prevents moisture from diffusing out of the plastic material and generates the required microclimate inside the bag. All this allows the desired storage conditions to ensure quality during the storage process.

This packaging solution is called “Moisture Impermeable Bag” (**MIB**). The material of the MIB consists of a layer structure with different barriers. The main barrier is a metallized aluminum layer, what creates a very low “Water Vapor Transmission Rate” (**MVTR**) according to the standard **DIN EN ISO 15106-1**.

Fig.1: A standard packaging unit in the Moisture Impermeable Bag (MIB)

3.1 Additional Information Label on Moisture Impermeable Bag (MIB)

The label provides a summary of the purpose of the MIB and some handling recommendations to ensure the quality of the packed snap ferrites.

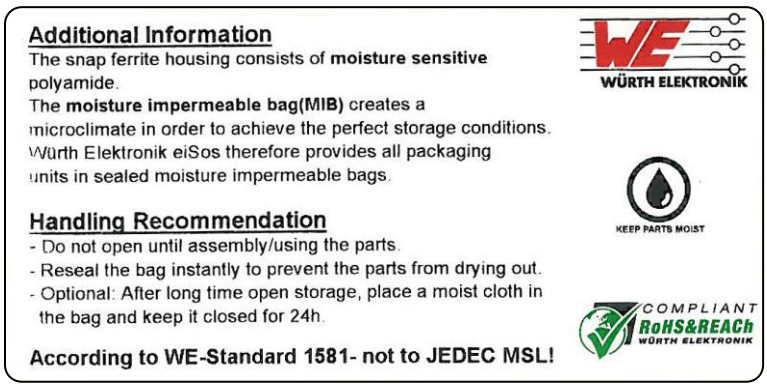


Fig.2: Label with additional information

3.2 Additional Attention Label on Moisture Impermeable Bag

To call the employees in the incoming goods (inspection) department pay attention and read the recommended handling instruction, an eye-catching label is placed on the aluminium bag.

3.3 Evaluation of the new packaging solution

As described under topic 2.2, a real-time test was performed for a duration of 3 months under the most extreme storage conditions. The test result was positive; the functionality of the products can be guaranteed under these extreme storage conditions.

Storage test: packed in MIB

Storage test: unpacked

3.4 Storing at WE eiSos

As part of the production process, the parts will run through a conditioning process to accumulate with the necessary moisture level. After that, the parts will be packed and stored in standard packaging quantities (full carton) in the **Moisture Impermeable Bag**.

Orders with less than a standard packaging quantity will be commissioned in a climate controlled storage room with the following climatic conditions:

Temperature: 20°C (-5°C/+15°C), Humidity 50% (-5% | +15%)

This orders will be packed as partial quantity packaging and will also be sealed in Moisture Impermeable Bags. For further information compare **6. Process chain:** Conditioning.

4.Handling of incoming goods – On customer side

4.1 Opening the packaging

The bag should be opened as close as possible below its sealing, so that there is enough space to reseal it. The excess material below the seal is designed to allow to be resealed.

4.2 Correct storage on customer side

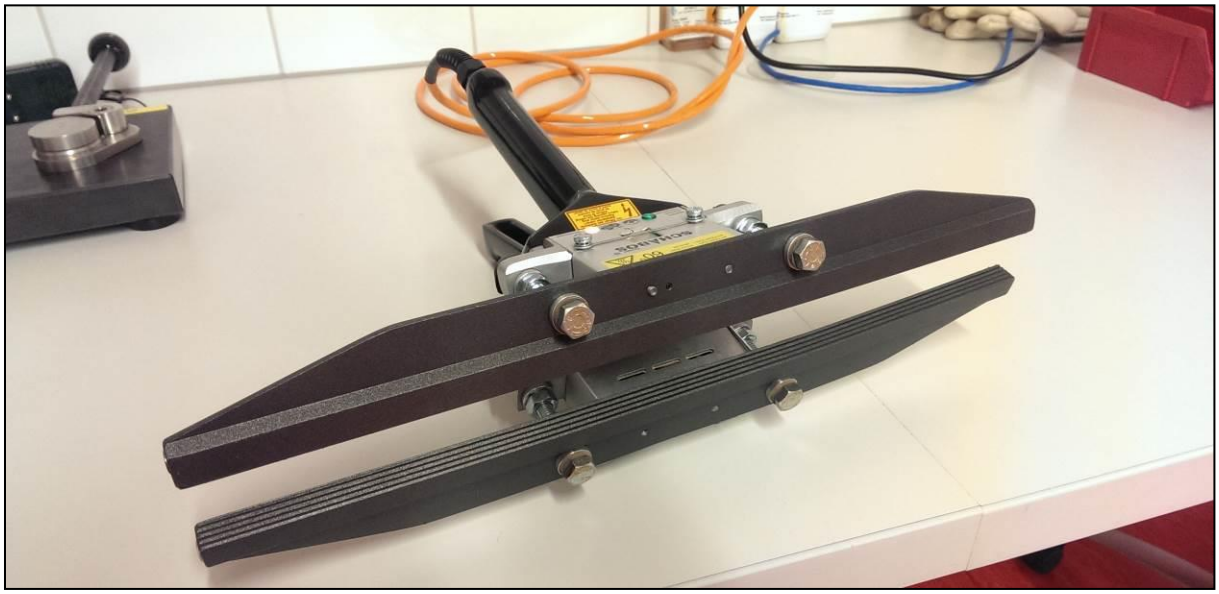
To protect components from drying out after first being opened, we strongly recommend storing them in one of the three ways – depending on the need of storage time:

1. Resealing the bag with tape
Fold over the end of the bag several times and seal it with adhesive tape. The most effective is if no gap remains, to avoid moisture to escape.
Maximum storage time: **1 month**

2. Resealing bags with heat sealing collet

Seal as close as possible at the top of the bag, so it will be possible to seal the bag again after part removal some of the components.

Maximum storage time: **1 year**



3. Storing the parts in a conditioned storage room

Conditions: Temperature: 20°C (-5°C/+15°C), Humidity: 50% (-5% | +15%)

Maximum storage time: **no limit**

5. Procedure in case of improper storage

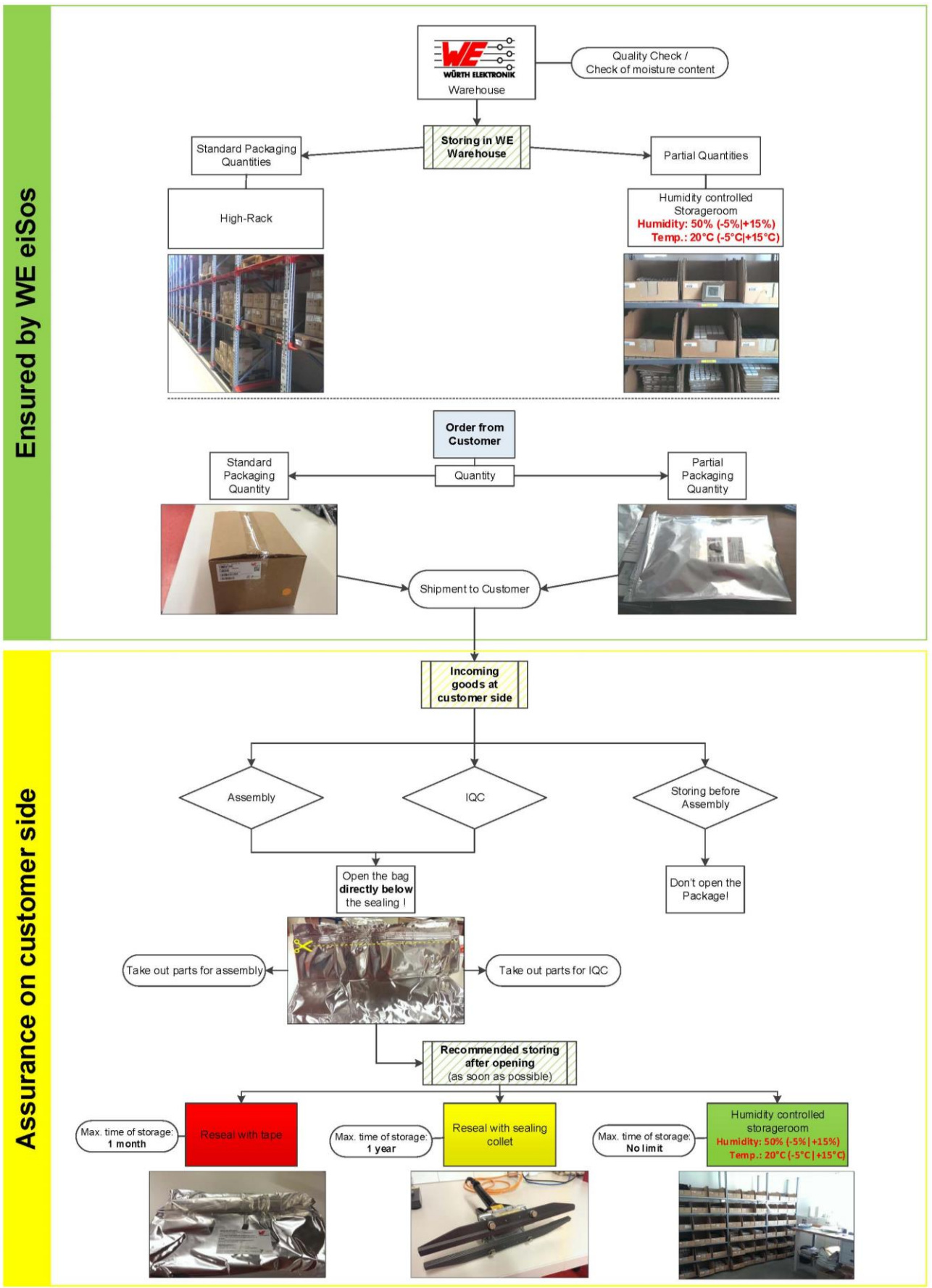
If components have been improperly stored or if an error in the form of a broken hinge should occur during assembly, the snap ferrites must be reconditioned immediately or at least 24h prior to assembly. The reconditioning process is quite simple and can be done with just a few resources. You will need a closed system (a waterproof bag, box with cover) and something that gives off moisture (moist towel of microfiber, paper or cotton, etc.).

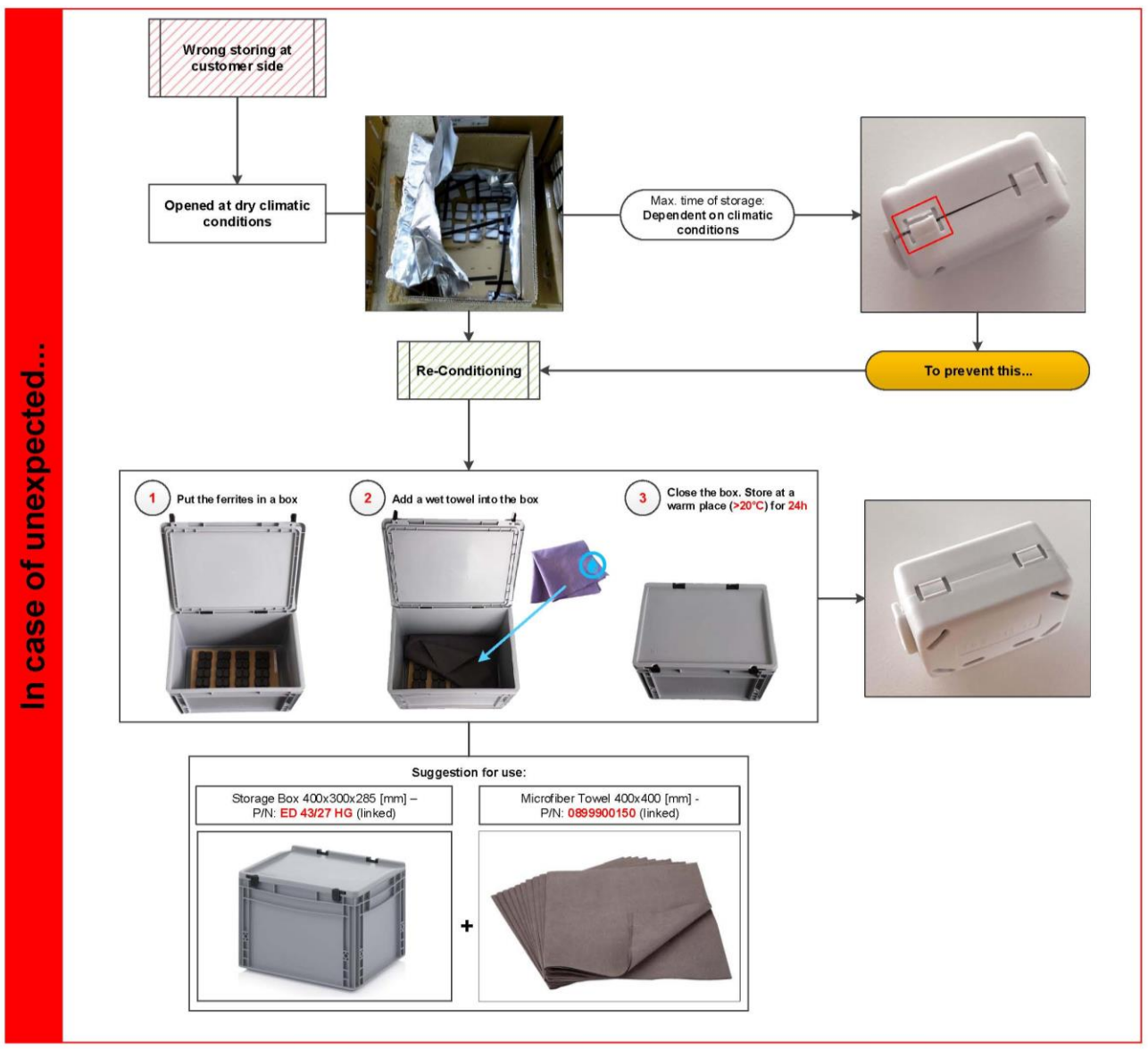
5.1 Reconditioning with a plastic box (recommended)

5.2 Reconditioning with bag

If you use the original aluminum or plastic bag for reconditioning, the snap ferrites are placed inside with a moist towel and the end of the bag is rolled up with tape, making it as airtight as possible. Then store this bag for at least **24 hours** in a warm environment **>20°C**.

6. Process chain: Conditioning





Important Information:

This document has only a validation in combination with **WE Standard 1581**. If it is send out without the Standard it has no validation unless it is premitted by the responsible Product Manager! The reason is, the content of these documents is connected to each other and some points could be missunderstood without the whole content.

7. Disclaimer

Descriptions and recommendations in this document are based on in-company tests performed by Würth Elektronik. Due to indeterminable external influences and climatic conditions, no guarantee can be given that a hinge will not break. The recommendations described in this document cannot be applied to other products. It is not permitted to copy or pass them on to third persons; this requires the approval of Würth Elektronik eiSos GmbH und Co. KG.