FEMSnap

User Guide for the calculation tool at TechCenter Semi-Crystalline Products

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1. Introduction

"FEMSnap" is the name for a calculation service of LANXESS Deutschland GmbH intended to support you during the design of several different kinds of snap fits made out of Durethan® und Pocan®.

FEMSnap is a self-explanatory web application. You should therefore be able to use FEMSnap without further preparation.

This document contains the following information:

− Structure and function of FEMSnap
− Menus and input fields you will find while using FEMSnap
− Explanation and interpretation of the results

Should you have any further questions, please contact us via email to durethan-pocan@lanxess.com.

We hope you will find FEMSnap useful and wish you much success using this tool.
2. Main page

2.1 Main page – explanation
At FEMSnap’s main page you will find:

A Introduction
purpose and basic structure of FEMSnap

B Premises of use
here you will find the requirements for the use of FEMSnap as well as the link to the registration procedure. Registration is mandatory to access this calculation tool.

C Examples
showing what FEMSnap is capable of

D Links to the calculation of several geometries
Icons illustrating the snap-fit to be chosen

E Help - links to
- quick guide
- comprehensive instructions (this manual)

F Contact
Room for question, critics and suggestions
3. Data entry form

The data entry form of FEMSnap is accessible to registered users only. Its basic items are the same for all snap-fit geometries and it consists of following fields which should be entered in the following order:

1. Material data: Selection of plastic type
2. Material grade: Selection of specific grade
3. Temperature: Selection of environmental temperature
4. Coefficient of friction: Selection of the coefficient of friction
5. Job name: Title for the calculation, documentation
6. Conditioning: Choice of the condition (dry or wet) of Durethan®
7. Geometry data: Dimensions of the snap-fit and the deflection. In order to avoid technical problems, the entry of the geometry data is tied to a feasibility check which admits only technically meaningful dimensions. The allowable values are shown below the input table under the "limits" field. In order to avoid unnecessary problems, the input should be done in the given order.

The "calculate" button is used to start the process and the user is asked to confirm the required conditions.

To explore design alternatives, the user may change the input data and submit other calculation requests (Figure 3).

4. Calculation results

The calculation results are delivered per e-mail to the user as a pdf-document (Figure 4).

According to experience, you should not need to wait longer than five minutes for your results. Longer delivering times may be due to a slow mail delivery.
system or at a strong utilization of the calculation module.

Figure 4  calculation results (example)

4.1 Calculation results - explanations
The pdf-document consists of two pages. On the first page, the entire input is documented. The sec-

ond page contains graphics of the strain distribution of the snap-fit in the distorted condition. The legend shows contour plot colors corresponding to the maximum principal strains in percentage values.
Below the graphic results, a table shows the following values:

- **Calculated strain**: maximum principal strains in percentage including a comment on whether the maximum value is allowable or not for the specific material in question
- **Admissible strain**: allowable strain for a one-time loading for the corresponding ambient temperature
- **Failure strain limit**: strain-value from which permanent deformation (major plastic strain) or failure (break) is to be expected. The gap between the admissible strain and the failure strain limit is an area the designer may use if he has made positive experiences with similar parts. Verification that the part will meet the requirements in practical use will be the manufacturer’s responsibility.
- **Deflection force**: force magnitude that results in the specified deflection for the chosen material
- **Insertion force**: force magnitude to assemble the snap-fit
- **Pull-out force**: force magnitude to disassemble the snap-fit

FEMSnap-calculations are based on linear material-data, as a Secant-Modulus at approx. 1 % strain and a Poisson-ratio of 0.4. Due to it, under unfavorable conditions (local strain concentrations and high strain values), the calculated deflections force can be afflicted by an error of about 25 %. As a rule, the calculated deflection forces are expected to be too high.

The insertion and pull-out force are determined by the calculated deflection force, the slant angle (α₁ or α₂) and the coefficient of friction (μ). In theory, the forces needed for insertion and pull out become infinitely high when the slant angle and the friction angle (ρ = arctan μ) add up to 90° or more. In this case, no values but the comment “undetermined” is shown, i.e., there is no solution for the snap-fit and the snap-fit is considered to be inseparable.

Since the force values are strongly dependent on friction and the assembling conditions, the user is advised to keep the calculate forces only as a theoretical order of magnitude.

This information and our technical advice - whether verbal, in writing or by way of trials - are given in good faith but without warranty, and this also applies where proprietary rights of third parties are involved. Our advice does not release you from the obligation to verify the information currently provided - especially that contained in our safety data and technical information sheets - and to test our products as to their suitability for the intended processes and uses. The application, use and processing of our products and the products manufactured by you on the basis of our technical advice are beyond our control and, therefore, entirely your own responsibility. Our products are sold in accordance with the current version of our General Conditions of Sale and Delivery.

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