

FEMSnap

Users Guide

Introduction:

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

With these instructions, you can prepare yourself "off-line" on the use of FEMSnap


In this document you will find information about:

- Snap-fit basics
- The structure and operation of FEMSnap
- FEMSnap online menus and input fields
- Interpretation of results

Should you have any further questions, please contact us under the "contact " link of the start menu.

We hope you find FEMSnap useful and wish you much success using it.

Starting page: (view)



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Search
Home
Language/Region
Contact us
Sitemap
Login

Semi-Crystalline Products

TechCenter EMEA

Products Applications Technologies Services Literature

1 FEMSnap

Troubleshooting
Cost Calculator
Unit Converter
FEMSnap
Sales offices
FAQ
GL View
Campus

2 Examples

Here are some examples for FEMSnap calculation results:

- Example I-Snap R1

3 Requirements

For the use of FEMSnap you have to fulfill the following requirements:

- Registration as a user of the TechCenter
- Own eMail account to receive the calculation result
- Adobe Acrobat Reader, Vers. 5 and above


4 Manuals

These documents may help you while using FEMSnap:

- Quick Guide
- Manual (PDF)
- General Information (PDF)

5 Contact

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To the top

Registration here

Input page (see page 5)




Starting page: (explanations)

At FEMSnap's main page you will find:

1. Introduction
→ Purpose and basic structure of FEMSnap
2. Example
→ showing what FEMSnap can do
3. User requirements
→ including user registration in the Bayer Plastics Tech Center
4. User instructions
→ consisting of:
 - a Quick Guide and
 - a Users Manual
 - a link to ATI 1119
→ explains the use of FEMSnap and gives you further information how to design snap joints in plastics
5. Contact
→ giving the user the opportunity to ask questions, send comments or suggestions
6. Thumbnails
→ Icons illustrating the snap-fit selection

Input page: (view before starting the calculation)



Search
Home
Language/Region
Contact us
Sitemap
Logout

Semi-Crystalline Products

TechCenter EMEA

Products Applications Technologies Services Literature

Troubleshooting
Cost Calculator
Unit Converter
FEMSnap
Sales offices
FAQ
GL View
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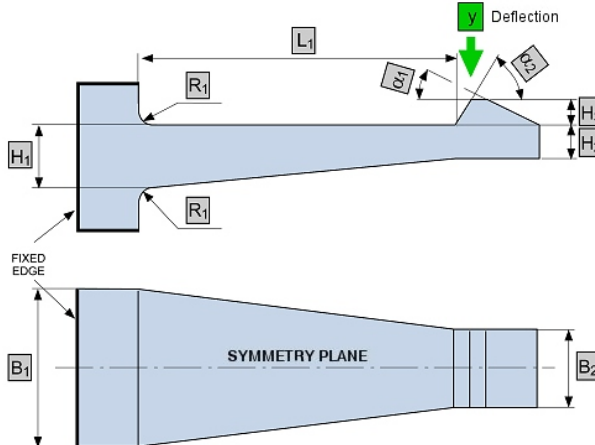
FEMSnap: I-Snap R1

[Quick Guide](#) [Manual \(PDF\)](#)

Material Data:

1 Material:	Durethan	2 Grade:	AKV 30 H2.0
3 Temperature:	23 °C	4 Coefficient of friction:	0.5
5 Job name:	Example 1	6 Conditioning:	yes

Geometry Data



7 Dimension Value

H ₁ [mm]	3.5
H ₂ [mm]	2
H ₃ [mm]	1.5
B ₁ [mm]	9
B ₂ [mm]	4
L ₁ [mm]	15
R ₁ [mm]	0.75
α ₁ [°]	30
α ₂ [°]	70
y [mm]	1.45

Limits:

Minimum	Maximum
>0	7.5


Calculate

click to run the calculation

⏪ To the top 🖨️ Printversion 📌 bookmark


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Input page: (view after starting the calculation)



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Troubleshooting

Cost Calculator

Unit Converter

FEMSnap

Sales offices

FAQ

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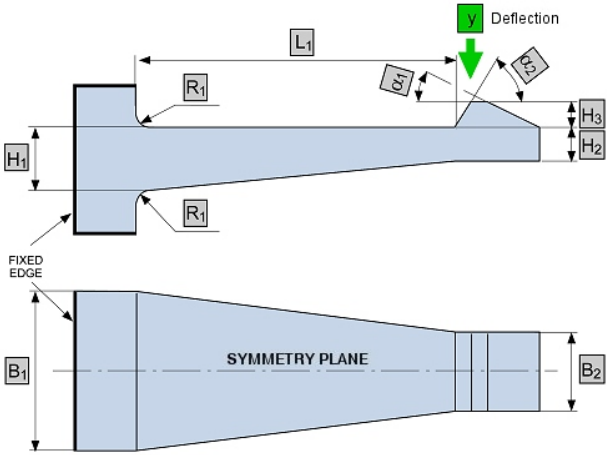
FEMSnap: I-Snap R1

Material Data:

1 Material:	Durethan	2 Grade:	AKV 30 H2.0
3 Temperature:	23 °C	4 Coefficient of friction:	0.5
5 Job name:	Example 1	6 Conditioning:	yes

Input data to calculate your snap are forwarded in the job queue. In a few minutes you will receive a result by email.

Geometry Data:



7 **Dimension Value**

H ₁ [mm]	3.5
H ₂ [mm]	2
H ₃ [mm]	1.5
B ₁ [mm]	9
B ₂ [mm]	4
L ₁ [mm]	15
R ₁ [mm]	0.75
α ₁ [°]	30
α ₂ [°]	70
y [mm]	1.45

total change of the input

partial change of the input

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Input page: (explanations)


The input page of FEMSnap is password-accessible to registered users only. The input page is basically the same for all snap-fits and consists of following inputs which should be entered in the following order:

1. Material Selection → Selection of the thermoplastic type
2. Material grade → Selection of the thermoplastic sub-type
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 and Triax
7. Geometry Data → Dimensions of the snap-fit and the deflection

In order to avoid technical problems, the input 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.

Calculation results: (view)

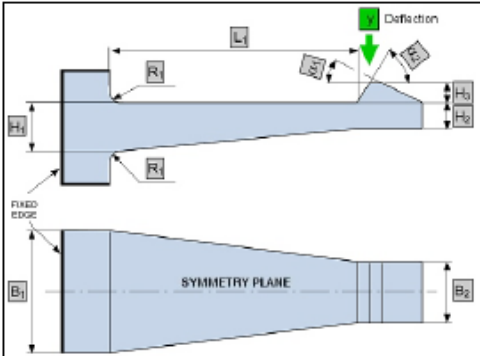


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FEMSnap-Service


Input of Alexander Maszewski, Job-Name: Example 1

Material name	Durethan AKV 30 H2.0
Temperature	23 °C
Conditioning	Yes
Coefficient of friction	0.5



Dimension	Value
H1 (mm)	3.5
H2 (mm)	2.0
H3 (mm)	1.5
B1 (mm)	9.0
B2 (mm)	4.0
L1 (mm)	15.0
R1 (mm)	0.75
α1 (°)	30.0
α2 (°)	70.0
y (mm)	1.45

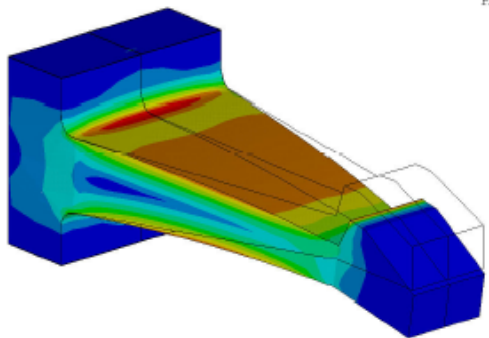
Thank you for using our service.



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Output of Alexander Maszewski, Job-Name: Example 1

equivalent strain ANSYS 8.1
PLOT NO. 1



value*100 -> strain in %

.26E-03 .24E-02 .45E-02 .66E-02 .86E-02 .11E-01 .13E-01 .15E-01 .17E-01

Maszewski Alexander, Example_1, Durethan, AKV 30 H2.0

Summary of results:

Calculated strain	%	1.9	admissible
Admissible strain	%	2.0	for a total one time deflection
Failure strain limit	%	4.0	damage or fracture
Deflection force	N	94.2	in the y-direction
Insertion force	N	142.7	
Patrol force	N		undefined, impossible, see manual

All results are approximate; for further explanations and assumptions see FEMSnap-Manual.

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Calculation results: (explanations)

The calculation results are delivered per e-mail to the user in a pdf-document.

According to experience, you should not 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.

The pdf-document consists of two pages. On the first page, the entire input is documented. The second 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 (plastic strain) or failure (break) is to be expected.
- 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


Calculation results: (explanations)

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 unfavourable 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 force are expected to be to high.

The insertion and pull-out force are determined by the calculated deflection force, the slant angle (α_1 or α_2) and the coefficient of friction (μ , see ATI 1119). In theory, the forces needed for insertion and pull out become infinitely high when the slant angle and the friction angle ($\rho = \arctan \mu$) 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**.

Hint:

Further information on the use and implementation of thermoplastic snap-fits can be found in our ATI 1119 (see main menu:  User instructions).