



Bayer MaterialScience

# FEMSnap Users Guide

---

Business Unit Polycarbonates

# 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 reach us under the "contact " link of the start menu.

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



# Startpage (see page 6)



extended search >>>

> Search string

- Campus **1**
- Costing
- Fantasia
- Troubleshooting Injection Molding
- Troubleshooting CD
- Cool Tool
- Cool Pressure Tool
- > FEMSnap**
- Design and Processing Properties
- GL View
- Processing & Design
- Processing refer **2**
- Bayer Links

Bayer Global  
Bayer MaterialScience  
BayerONF

## [ FEMSnap ]

Take advantage of our wide range of additional features!

The name "FEMSnap" stands for a web based calculation-service offered by Bayer MaterialScience to dimension miscellaneous snap fits made of various Bayer MaterialScience engineering thermoplastics. The program is based on the Finite-Element-Method (FEM) and allows quick and easy evaluation of snap-fits when analytical methods are insufficient or impractical. Calculation results and recommendations are immediately delivered via e-mail to the user. FEMSnap is self-explaining and needs no instructions.

FEMSnap is available to qualified users after a [one-time registration](#).

### [To the selection of snaps](#)

Nevertheless, a Quick Guide and a Users Manual are available at the Bayer MaterialScience online technology portal.

### Examples

Here are some examples for FEMSnap calculation results:  
[example](#)

To the selection side!

# Startpage (see page 6)

TechCenter PC-Film  
TechCenter TPU  
Thermoplastics Testing  
Center

3

## Requirements

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

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

General Conditions of Use  
Privacy Statement  
Imprint

4

## Manuals

These documents may help you while using FEMSnap:

[Quick Guide](#)

[Manual \(PDF\)](#)

[General Information\(PDF\)](#)

5

## Do you have questions?

[Contact Bayer MaterialScience](#)

 Print
















extended search >>>

> Search string

- Campus
- Costing
- Fantasia
- Troubleshooting Injection Molding
- Troubleshooting CD
- Cool Tool
- Cool Pressure Tool
- >FEMSnap**
- Design and Processing Properties
- GL View
- Processing & Design
- Processing references
- Bayer Links**
- Bayer Global
- Bayer MaterialScience
- BayerONE
- TechCenter PC-Films
- TechCenter TPU
- Thermoplastic Tactica

## [ FEMSnap Calculation ]

Please choose one out of the snap fits shown below!

I-Snap R1 	I-Snap R2 	I-Snap RS1 	I-Snap RS2 
L-Snap 	V-Snap 	C-Snap 	O-Snap 
S-Snap 	T-Snap 	B-Snap 	

Thumbnails: Icons illustrating the snap-fit selection

# Startmenu

---

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 MaterialScience Plastics TechAssistant
4. User instructions, consisting of:
  - a Quick Guide and
  - a Users Manual
  - a link to ATI 1119
5. Contact: giving the user the opportunity to ask questions, send comments or suggestions



# Input page (before the start of the calculation)

**[FEMSnap: I-Snap R1 ]**

Material Data		
Material	Grade	Temperature
Bayblend	T65	23 °C
Coefficient of friction	Job name	Conditioning
0.4	Test	--

Dimension	Geometry Data
H <sub>1</sub> [mm]	3.5
H <sub>2</sub> [mm]	2
H <sub>3</sub> [mm]	2
B <sub>1</sub> [mm]	10
B <sub>2</sub> [mm]	6
L <sub>1</sub> [mm]	30
R <sub>1</sub> [mm]	1
α <sub>1</sub> [°]	40
α <sub>2</sub> [°]	70
y [mm]	2
Limits	
Minimum	>0
Maximum	15

The diagram shows a tapered mechanical part with a fixed edge on the left. The part has a length L<sub>1</sub> and a thickness y. The top and bottom edges are curved with a radius R<sub>1</sub>. The top edge has a height H<sub>1</sub> at the fixed end and H<sub>2</sub> at the free end. The bottom edge has a height H<sub>3</sub> at the free end. The part is symmetric about a central axis labeled SYMMETRY PLANE. The width of the part is B<sub>1</sub> at the fixed end and B<sub>2</sub> at the free end. A green arrow labeled 'Deflection' points downwards from the top edge. A 'calculate' button is located at the bottom right of the diagram area.

# Input page (see page 7)

---


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 the Bayer MaterialScience's 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. 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.



# Calculation Results

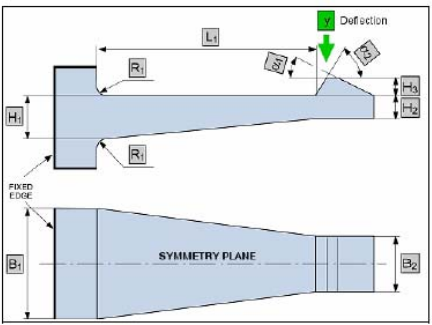




## FEMSnap-Service

**Input of Roland Brambrink, Job-Name: Test**


Material name	Bayblend T65
Temperature	23 °C
Coefficient of friction	0.4




Dimension	Value
H1 (mm)	3.5
H2 (mm)	2.0
H3 (mm)	2.0
B1 (mm)	10.0
B2 (mm)	6.0
L1 (mm)	30.0
R1 (mm)	1.0
α1 (°)	40.0
α2 (°)	70.0
y (mm)	2.0

Thank you for using our service.

1
10-07-2007

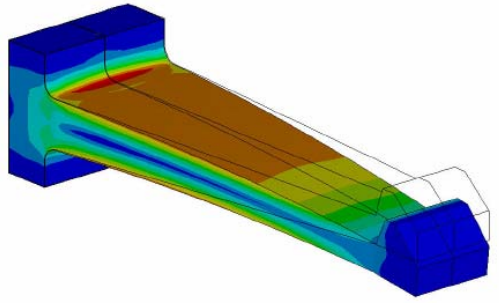




### Output of Roland Brambrink, Job-Name: Test

equivalent strain

ANSYS 10.0  
PLOT NO. 1



value\*100 -> strain in %

.32E-04   .87E-03   .17E-02   .25E-02   .34E-02   .42E-02   .51E-02   .59E-02   .67E-02   .76E-02

Brambrink Roland, Test, Bayblend, T65

#### Summary of results:

Calculated strain	%	0.8	admissible
Admissible strain	%	2.0	for a brief one time deflection
Failure strain limit	%	4.0	damage or fracture
Deflection force	N	3.1	in the y direction
Insertion force	N	15.9	
Pull-out force	N		undetermined (variable, see manual)

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

#### Disclaimer:

All the information, documents and illustrations published on this website are the exclusive property of Bayer MaterialScience AG. Permission for their use is given on the proviso that the copyright note appears on all copies, that only personal and not commercial use is made of the information, that the information is not altered in any way and that all illustrations on the website are used only in conjunction with the associated texts. Bayer MaterialScience AG provides no guarantee in respect of the information, documents and illustrations on the website. Bayer MaterialScience AG is not responsible for any damage or whatever nature that might arise from the use or existence of the website and the information, documents and illustrations it contains. The user bears full responsibility for all risks to him that might arise from the use of this website. Bayer MaterialScience AG reserves the right to amend or supplement the website at any time and without prior notice. The user of the website is responsible in full for the content and accuracy of all information that he sends to Bayer MaterialScience AG and for ensuring that the rights of third parties are not prejudiced.

2
10-07-2007

# Calculation Results (see page 9)

---

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 snap-fit
- Pull-out force: force magnitude to disassemble snap-fit



# Calculation Results (see page 9)

---

FEMSnap-calculations are based on linear material-data, as the Secant-Modulus at approx. 1 % strain and the Poisson-ratio of 0.4. The insertion and pull-out force are determined by the calculated deflection force, the slant angle ( $\alpha$  or  $\alpha'$ ) and the coefficient of friction (see ATI 1119). In theory, the forces needed for insertion and pull out become infinitely high when the slant angle ( $\alpha$  or  $\alpha'$ ) and the friction angle ( $\rho = \arctan \mu$ ) add up to  $90^\circ$  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, the user is advised to keep the value of the coefficient of friction within recommended limits.

## Hint:

Further information on the use and implementation of thermoplastic snap-fits can be found in our ATI 1119 (see main menu: **4** User instructions).



