

Test&Motion

Application Module:

KU 9 – 3–point Bend test acc. EN ISO 178

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Contents:

1	INTRODUCTION	4
1.1	Symbols	4
2	APPLICATION MODULE KU 9: 3-POINT BEND TEST ACC. EN ISO 178	5
2.1	Field of application	5
2.2	Test graphic KU 9	5
2.3	Input values KU 9	6
2.4	Results KU 9	7
2.5	Hints for the test KU 9	8
2.5.1	Pre-load F_0	8
2.5.2	Determination of zero point of flexural strain	8
2.5.3	Calculation of flexural stress	8
2.5.4	Calculation of flexural strain	9
2.5.5	Calculation of flexural modulus	9



1 Introduction

Dear customer, thank you for choosing a product of **DOLI Elektronik GmbH**. **Test&Motion** is a modern application for the operating systems Microsoft Windows XP/7/8/10®.

This manual does not deal with the **Test&Motion software** in general but with the application module Plastics Tensile Test KU 9 in particular. Hence, it is recommended to read the **Test&Motion** application manual in order to get familiar with the software. Please follow the demands and safety hints listed in the manual!

1.1 Symbols

The different symbols in this manual will allow you to find your way more easily.

Table 1: Symbols and their meanings.

Symbol	Meaning
	Safety Instructions: In order to avoid interruptions in the work flow as well as damages to man and machine, follow the safety instructions at all cost.
	Job/work instructions: Instructive part of the document with precise work instructions. Here you are asked to do something.
	Information: General information and descriptions of working procedures, etc.
	Note: Important note for the operation, the function or for the working procedures.
	Tip: Gives tips for easy handling of the Test&Motion Software , the EDCs or the testing instrument.

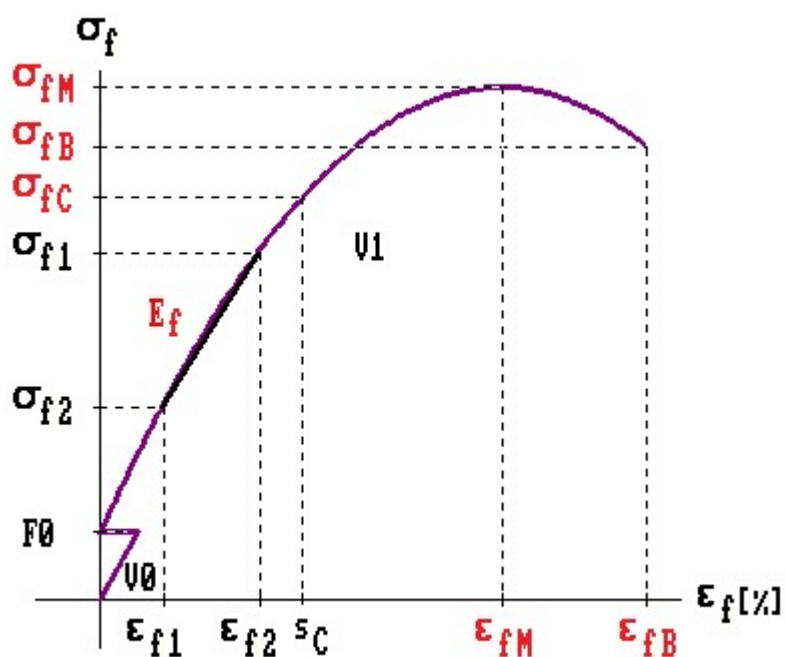


2 Application module KU 9: 3–point Bend test acc. EN ISO 178

2.1 Field of application

Determination of bending strength, edge fibre extension and E module on plastics in 3 point bending test. Determination of flexural properties.

2.2 Test graphic KU 9





2.3 Input values KU 9



1. Click [Menu Test](#) → [Command Settings](#) → [Input values](#). Here you can find expedient input values for this test regulation, already. If necessary adjust the values to your needs.

Table 2: Input values for test KU 9.

Parameter	Meaning	Dimension / Selection possibilities
$\sigma_{f1}, \epsilon_{f1}$	Limit 1 for the calculating the module	[N], [MPa], [mm], [%]
$\sigma_{f2}, \epsilon_{f2}$	Limit 2 for the calculating the module	[N], [MPa], [mm], [%]
E1	Reference value 1	• [N] • [N/mm²] • [mm_S] • [mm_dL] • [%] • [s, min, h]
E2	Reference value 2	Dimensions similar to E1
E3	Reference value 3	Dimensions similar to E1
Choice:	Correction bending stress	• Yes • No



2.4 Results KU 9



1. Click [Menu Test](#) → [Command Settings](#) → [Results](#). Here you can already find expedient results. If necessary, adjust the values to your needs.

Table 3: Results for test KU 9.

Parameter	Meaning	Dimension
fM	Maximum load	[N]
σ_{fM}	Maximum flexural stress sustained by the test specimen during the bending test	[N/mm ²], [MPa]
ϵ_{fM}	Flexural strain at maximum flexural stress	[%]
sfM	Deflection at maximum flexural stress	[mm]
fB	Load at break	[N]
σ_{fB}	Flexural stress at break of the test specimen	[N/mm ²], [MPa]
ϵ_{fB}	Flexural strain at break	[%]
sfB	Deflection at break	[mm]
Ef	Ratio of the stress difference $\sigma_{f2} - \sigma_{f1}$ to the corresponding strain difference $\epsilon_{f2}(=0,0025) - \epsilon_{f1}(=0,0005)$	[MPa]
Mb	$f_B * L / (4 * b * h^2)$	
A1x	Output value 1 at input value E1	
A1y	Output value 2 at input value E1	
A2x	Output value 1 at input value E2	
A2y	Output value 2 at input value E2	
A3x	Output value 1 at input value E3	
A3y	Output value 2 at input value E3	
sC	Deflection equal to 1,5 times of thickness h of the test specimen	[mm]
σ_{fC}	Flexural stress at the conventional deflection sc	
S0	Sample diameter	[mm ²]
l	Length of specimen	[mm]
h	Thickness of specimen	[mm]
b	Width of specimen	[mm]
L	Length of span between support	[mm]

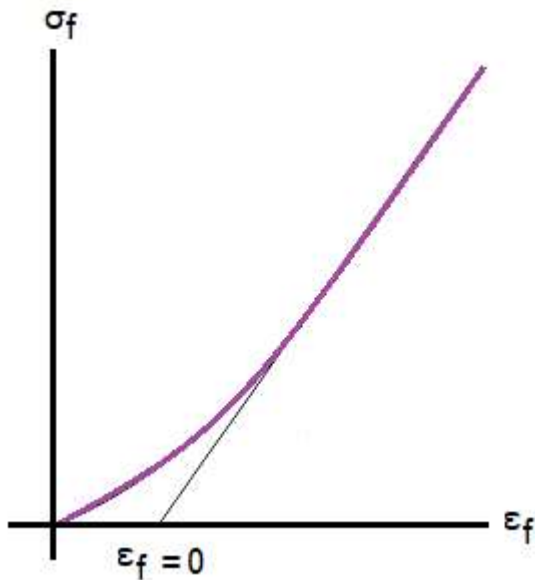


2.5 Hints for the test KU 9

2.5.1 Pre-load F0

For the test control bending path and strain set to 0 at this point.

2.5.2 Determination of zero point of flexural strain



The extension of the linear part of the curve to the x-axis results in the zero point of the strain.

2.5.3 Calculation of flexural stress

$$\sigma_f = \frac{3 F L}{2 b h^2}$$

Where

σ_f	Flexural stress	
F	Applied force	[N]
L	Span	[mm]
b	Width	[mm]
h	Thickness	[mm]



2.5.4 Calculation of flexural strain

$$\epsilon_f = \frac{600 s h}{L^2} \%$$

Where

ϵ_f	Flexural strain	[%]
s	Deflection	[mm]
L	Span	[mm]
h	Thickness	[mm]

2.5.5 Calculation of flexural modulus

$$E_f = \frac{\sigma_{f2} - \sigma_{f1}}{\epsilon_{f2} - \epsilon_{f1}}$$

Where

E_f Flexural modulus [MPa]

σ_{f2} flexural stress at deflection s2

σ_{f1} flexural stress at deflection s1

2.5.6 Pairs of reference values

Three pairs of reference values are available. Here, you can define the wanted result type by choosing the dimensions for these pairs See the following table:

Table 4: Meaning of the input and output values.

Dimension of input- and output values	Meaning
N, kN	Load
N/mm ²	Stress
%	Strain



mm_dL	Deflection
mm_S	Crosshead travel
s, min, h	Time period
Dim User1	User defined meaning 1
Dim User2	User defined meaning 2
...	...
Dim User30	User defined meaning 30



Note: Please note that the tensile characteristics of plastics do very much depend on the test speed. Hence, we recommend to preferably not interrupt a test if possible!

