

Test&Motion plus
Application Module:
FE 22T – Torsion spring test

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1 Introduction

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

This manual does not deal with the **Test&Motion plus software** in general but with the application module Plastics Tensile Test FE 22T in particular. Hence, it is recommended to read the **Test&Motion plus** 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 plus Software , the EDCs or the testing instrument.

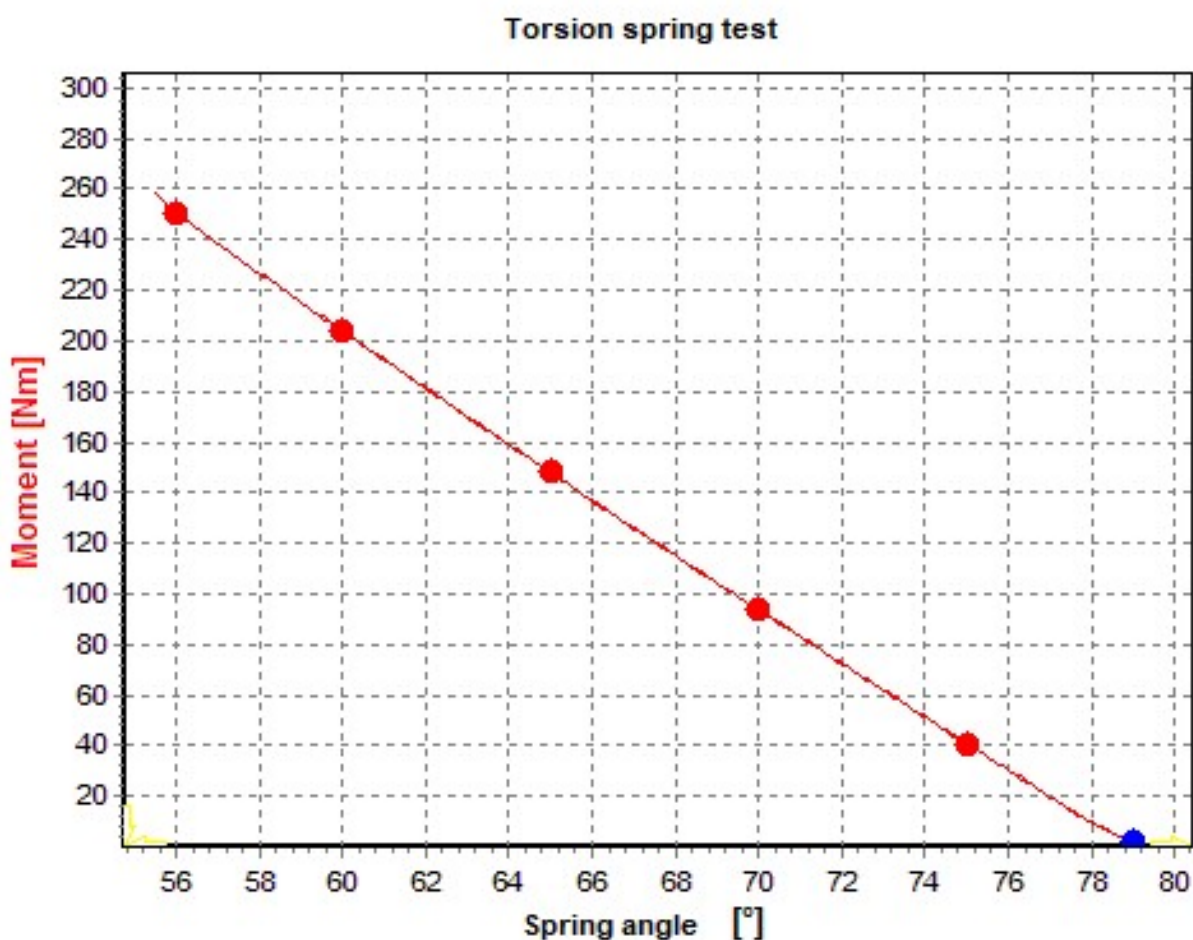


2 Application module FE 22T: Torsion spring test

2.1 Field of application

Determination of up to 10 reference points (torques, spring angles) in load direction left or right. The torsion springs can be loaded statically and dynamically, i.e. they can be stopped at the reference points for an adjustable time or they can be traversed to the reversal point. Setting cycles can be activated before the actual test. Using the built-in formula editor, additional spring characteristic values such as replacement spring rate can be calculated. After determining the deformation curve of the test device using an additional program (DEF) supplied, it is sent to the measuring electronics. Thus the spring angles are already determined during the test with deformation correction or are positioned on deformation corrected spring angles.

2.2 Test graphic FE 22T





2.3 Input values FE 22T



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.

Test settings

Input values

Load direction
☐ right
☒ left

Feed position: 100 °
 Start position: 60 °
 Reversal point: 10 °
 M max permissible: 1 Nm
 No. of SetCycles: 0
 Rev. point SetCycles: 50
 t SetCycles: 0 s
 t Time to slow down: 0 s
 Range spring rate: 0.1 °
 t meas. cycle: 5 s
 V Pos: 500 °/min
 V Test: 200 °/min
 V Set: 500 °/min
 V Return: 500 °/min

☐ Goto springlength L before start of test
 L: 0 mm, V = V Pos

Test method: static
 Test direction: loading
 Automatic return: Yes

Help input values

OK Abbrechen Übernehmen

Table 2: Input values for test FE 22T.

Parameter	Meaning	Dimension / Selection possibilities
Feed position	Tool distance (plate distance) at which the spring is inserted	[°]
Start position	From this spring angle the recording of measured values begins	[°]
Reversal point	Up to this value (spring angle, torque) the spring is loaded in left or right direction.	[°, Nm]
M max permissible	Max. moment during test.	[Nm]
No of Setcycles	Number of setcycles	
t Setcycles	Delay time during setcycles.	[s]
t Time to slow down	Braking time, Time until the drive is braked to avoid vibrations.	[s]



Range spring rate	To determine the spring rate the increase of the torque/spring angle curve over this range is determined.	[°]
t meas. cycle	Delay time during testcycles.	[s]
V Pos	Speed from Feed pos. to Start pos.	[°/min]
V Test	Test speed	[°/min]
V Set	Speed, when Setcycles are running	[°/min]
V Return	Return speed to Feed pos.	[°/min]
Choice:	Test method	- static - dynamic
Choice:	Test direction	- loading - reloading - loading + reloading - Intermediate unloading
Choice:	Automatic return	- No - Yes



2.4 Results FE 22T



Click **Ribbon Test → CONFIG, Settings FE 22** In this input dialog optimized especially for spring testing, you can define up to 10 reference values for the spring angle, 10 reference values for the moment, 10 spring rates and 10 spring rate curves.

This dialog has a different number of lines depending on the number of activated reference values.

In the following dialog the spring torque is determined for 3 different spring angles 75, 70 and 65 °, additionally the spring angle at 0.1 Nm torque. Spring rates and spring rate curves are not activated. The results can be marked in the test graphic ("Arrow" checkbox). Target values can be defined for each result and can also be displayed in the test graphics ("Tol.Window" checkbox). Up to 64 results can be activated.

Settings FE 22

Input

Number M Number W Number R Number RV

load	relo...	Ave...		[Dim]	Ref.	Ref2.	[Dim]	Nom.val...	Xm+abs.	Xm-abs.	Dim	Arr...	Tol.wind...
☒	☐	☐	M1	Nm	75		°	40	2	2	Nm	☒	☐
☒	☐	☐	M2	Nm	70		°	90	2	2	Nm	☒	☐
☒	☐	☐	M3	Nm	65		°	145	2	2	Nm	☒	☐
☒	☐	☐	a0	°	0,1		Nm	0	0	0	°	☐	☐

The entries in the dialog above automatically generate the following result line

	OK	Date	Time	M1l@75 °[Nm]	M2l@70 °[Nm]	M3l@65 °[Nm]	a0l@1 Nm[°]
0	x	27.10.18	11:37	38,14	71,37	104,54	81,32

The letter 'l' after M1, M2, M3 and a0 means 'load' and should indicate that the values were determined in load direction. The letter 'u' for 'unload' then stands for results which are determined when the spring is unloaded. The automatic naming of the results can be deactivated in the dialog 'Test settings | Results'. (Checkbox 'Do not rename').



Table 3: Results for test FE 22T.

Parameter	Meaning	Dimension
Number M	Number of reference values Spring angle → Moment	
Number W	Number of reference values Moment → Spring angle	
Number R	Number of spring rates	
Number RV	Number of spring rate profiles	
M1 .. M10	Moment at spring angle	[Nm]
a0 .. a9	Spring angle at moment	[°]
R1 .. R10	Spring rate	[Nm/°]
RV1 .. RV10	Spring rate profile	[Nm/°]



2.5 Hints for the test FE 22T

2.5.1 Delay time (t meas. cycle)

We distinguish between dynamic and static testing. In the dynamic test, a continuous run is performed between 'start position' and 'reversal point'. If 'static' is selected, the system stops at the points defined in the "Settings FE 22" dialog. The stopping time is defined by the input value 't measuring cycle', optionally the stopping point is held until the key <F11> has been pressed.

2.5.2 t Time to slow down

Default value is 0 , the machine stops abruptly at the defined points. With values > 0, the speed of the machine is reduced via a ramp whose length corresponds to the input value. This is to reduce possible vibrations of the spring.