Introduction

Requirements for measurements for parameterization with the program system RMOD-K FB are described in this document. It serves on the one hand the requester for measurements to define here a selection of measurement scopes and on the other hand those who carry out the measurements and deliver the measurement results, so that a parameterization for the program system RMOD-K can be carried out. In the section General Information the different requirements are presented. In the section Basic documentation, the person performing the measurement sets down basic properties of his measuring equipment and procedures. In the Individual documentation section, the requirements for the measurement are defined for each measurement type, whereby the value range and scope are defined. The output formats are also specified here. In the Packages section, the data valid for a specific tire measurement can be entered by the requestor and the measurement performer enters the respective output files in the individual package sections.

A standard measurement program is described, which has been successfully followed in the past. Nevertheless, changes can be useful in concrete projects, e.g. the reduction of certain measurements (e.g. modal analysis or force and moments) or the addition of specific measurements (e.g. temperature distributions), if the project goals make this necessary.

General Information

For each type of measurement, the person performing the measurement describes the measurement chain used (procedure of measurement, procedure of measurement data determination as a unique description). Here it is possible to refer to a general document. In each measurement, the procedure used is recorded as with a key: e.g. drum test rig xx, measurement procedure mm, surface type yy, impact bar zz.

Special attention should also be paid to documenting the sensors, filters, controllers and their settings used, as well as averaging over a number of tests for each test setup. In case of averaging, the base data (before averaging) should also be part of the measurement results (labeling under **COMMENTS e.g. base 1 of averaging 1, base 2 of averaging 1, ...).

For each measurement, the measurement result is stored in the form of a TDX file in ASCII format. Here all properties are documented in the **HEADER area, all constant measurement parameters in the **CONSTANSTS area, the measurement channels in the **MEASURCHANNELS area and the measurement data in the **MEASURDATA area. **END denotes the end of the file. The formatting and use of keywords allows the software-supported use of the measurements in the simulation. For this purpose, a separate document (RMOD-K-V7-Measurements-TDX_Format.pdf) -is provided.

Basically, a time column is always output for each measurement, which makes the temporal excitation for the simulation verifiable. This also applies to so-called "static" tests.

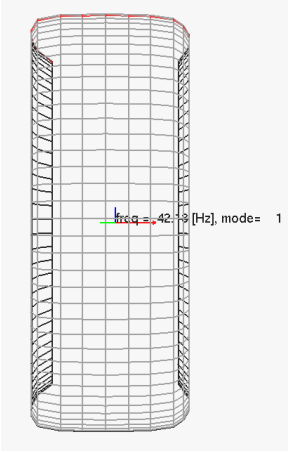
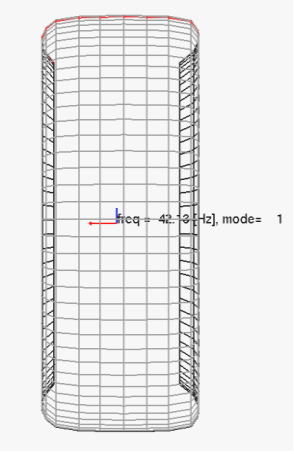
Basis documentation

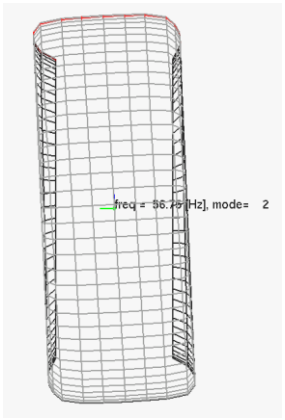
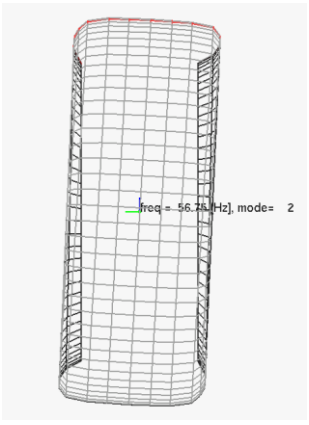
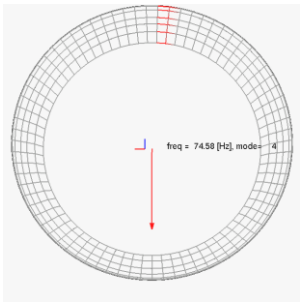
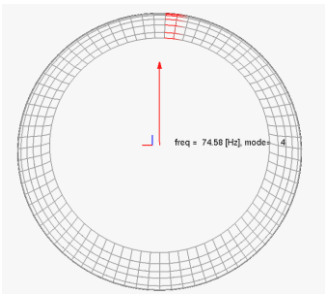
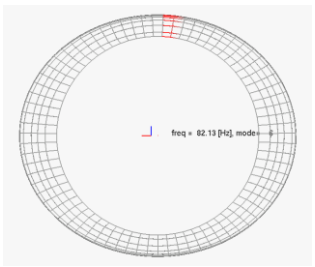
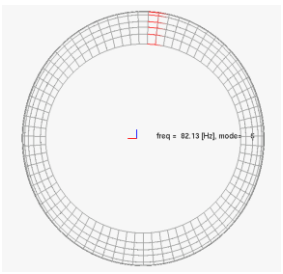
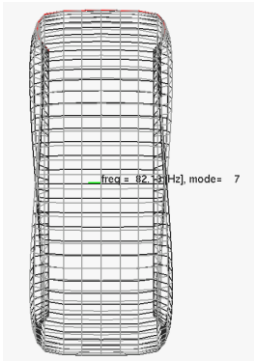
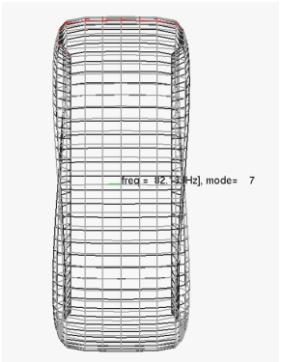
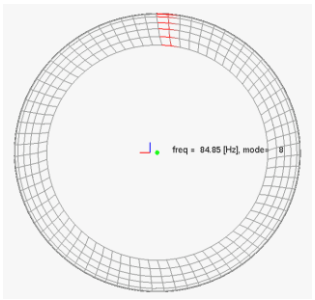
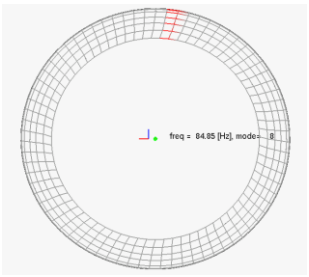
The documentation of the measuring equipment is defined in a separate description for each type of measurement and updated if necessary for each current measurement. In addition to the process description, the description of the test equipment (e.g. exact obstacle geometry in the case of obstacles on drums - drawing) and photos of the test equipment are also provided here, as well as properties of the surfaces (for friction value estimation) or conditioning (warm-up program) and the tire temperatures before and after the measurement.

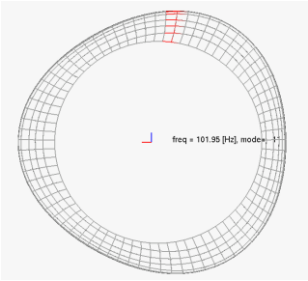
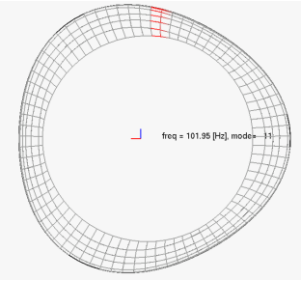
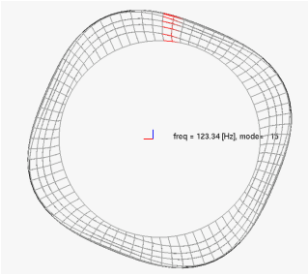
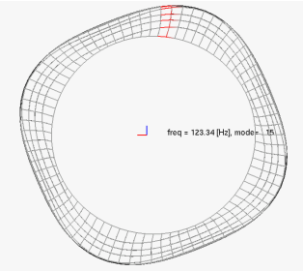
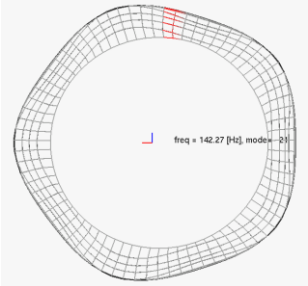
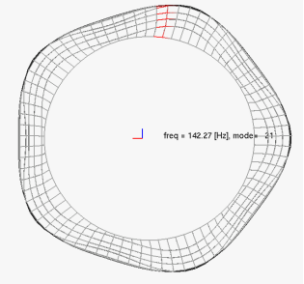
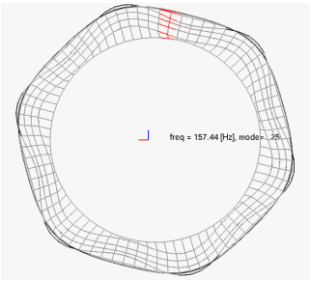
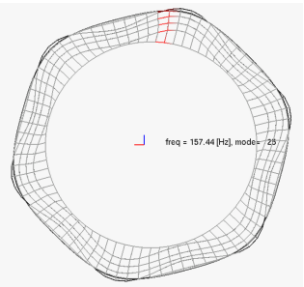
Individually documentation

Measurement groups are assigned for each measurement type and their general requirements for individual measurements are defined by measurement parameters as well as outputs, which are defined in the Package section for the current measurement project.

Block Static	LI	Inflation	
Vertical	up to LI 1,5	nominal inflation, (+/- 0.5 nominal inflation optional)	
	up to rim contact	nominal inflation, (+/- 0.5 nominal inflation optional)	
Longitudinal	LI = 0.4, 0.8 und 1.2	nominal inflation, (+/- 0.5 nominal inflation optional)	up to +10mm
Lateral	LI = 0.4, 0.8 und 1.2	nominal inflation, (+/- 0.5 nominal inflation optional)	up to +20mm
Torsional	LI = 0.4, 0.8 und 1.2	nominal inflation, (+/- 0.5 nominal inflation optional)	up to +4 Degree
Parking	LI = 0.4, 0.8 und 1.2	nominal inflation, (+/- 0.5 nominal inflation optional)	up to +-15 Degree
Block Cleats			
90 Grad 5x10 (Phase)	LI = 0.5, 0.8, 1.1	nominal inflation,(+/- 0.5 nominal inflation optional)	Vx = 20,30,60,90 km/h
90 Grad 10x10 (Phase)	LI = 0.5, 0.8, 1.1	nominal inflation,(+/- 0.5 nominal inflation optional)	Vx = 20,30,60,90 km/h
90 Grad 20x20 (Phase)	LI = 0.5, 0.8, 1.1	nominal inflation,(+/- 0.5 nominal inflation optional)	Vx = 20,30,60,90 km/h
45 Grad 20x20 (Phase)	LI = 0.5, 0.8, 1.1	nominal inflation,(+/- 0.5 nominal inflation optional)	Vx = 20,30,60,90 km/h
Block CrossSection			
	Outer contour mounted on rim and under internal pressure : nominal inflation + thickness distribution every 10mm as ASCII file		

	belt angle (and carcass angle if different from 90°, ply analog)		
	detailed photos showing the number and position of belt layers, carcass layers and other layers.		
Block Inertia			
total mass tire without rim			
moments of inertia IY of the measuring rim + rotating hub during cleat measurements			
Block Handling/ MF Tirefile (Camber 0)			
Longitudinal force measurement and lateral force as well as restoring torque at nominal inflation as MF.tire file or ASCII result file	LI = 0.5, 0.8, 1.1	nominal inflation,(+/- 0.5 nominal inflation optional)	Vx = 80 oder 100 km/h
Block Modes			
		nominal inflation	Description of modes by mode shape in text and image for load-free measurement
Mode1	RB-Lateral		

Mode2	RB-CamberSteer-ing		
Mode3	RB-Transversal		
Mode4	Radial-2Nodes		
Mode5	Transveral-2Node		
Mode6	RB-Torsional		

Mode7	Radial-3Nodes		
Mode8	Radial-4Nodes		
Mode9	Radial-5Nodes		
Mode10	Radial-6Nodes		
Block Footprint	LI = 0.5, 0.8, 1.1	nominal inflation,(+/- 0.5 nominal inflation optional)	
The format description shall be attached to the files to be delivered, which shall be provided in ASCII format.			

The following columns are output for each package in a TDX file:

Block Static			
Vertical	TIME, FZ,	Z-DEFLECTION	
Longitudinal	TIME FZ,FX,	X-DEFLECTION	
Lateral	TIME FZ,FY,	Y-DEFLECTION	

Torsional	TIME FZ,FY,MZ	STEERING ANGLE	
Parking	TIME FZ,FY,MZ	STEERING ANGLE	
Block Cleats			
45/90 Grad ixj (Phase)	TIME FX,FY,FZ	Y-Angle-Acceleration	
Block Cross-Section			
TIRE	Y-Tire,Z-Tire		
Block Inertia			
	total mass tire without rim		
	moments of inertia IY of the measuring rim + rotating hub during cleat measurements		
Block Handling/ MF Tirefile			
Breaking/Traction	TIME, SL, FX, FZ		
Steering	TIME, SA , FY, FZ, MZ		