VALIMAT

Templates and Reports

4a ENGINEERING GmbH

Content

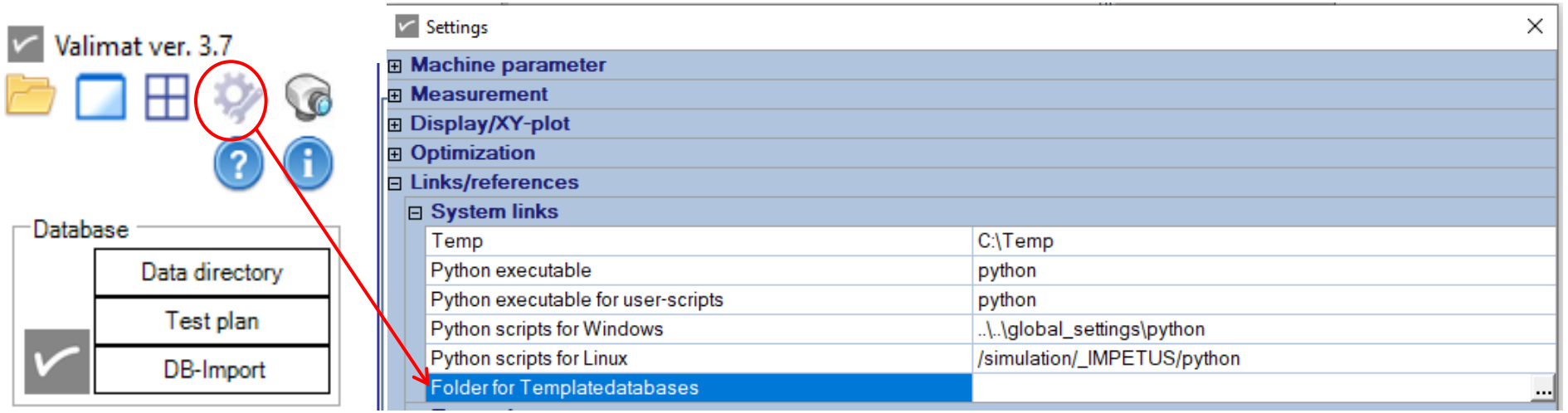
- VALIMAT® - Template database
- Automatic report generation

Recommended test packages – thermoplastic materials

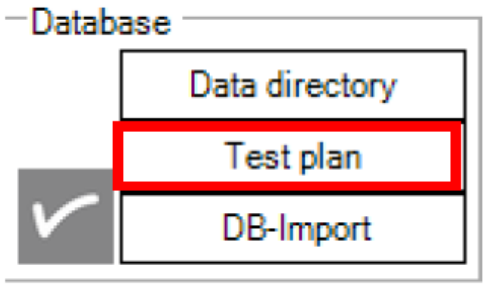
Material	isoP (unreinforced or talc reinforced plastic)				frP (fiber reinforced plastic)			
Package	***basic***	***standard + temperature***		***professional***	***basic***	***standard + temperature***		***professional***
Material cards	1	1	2	1	2	2	4	1
Plate 102x80x 2mm		50	25	50	100	100	100	100
Multi specimen plate	50	50	100	100				50
Temperature	23°C	23°C	-30°C & 80°C	23°C	23°C	23°C	-30°C & 80°C	23°C
Static bending	2	2	4	2	2	2	8	2
Dynamic bending	3	3	4	3	6	6	8	6
Dynamic tension bending		1		1				
Static tensile test		1	2	1		2		2
Dynamic tensile test				1				2
Static puncture test				1				1
Dynamic puncture test		1	2	1		1	2	1
Static component test				1				1
Dynamic compnent test				1				1
Repetitions	5	5	5	5	5	5	5	5
Measurements	25	40	60	60	40	55	90	80
Remark		Detailed testing at 23°C			Orientation 0° & 90°	Orientation 0° & 90°		

strain rate/hardening	compression/tension-asymmetry	damage/failure	validation on component

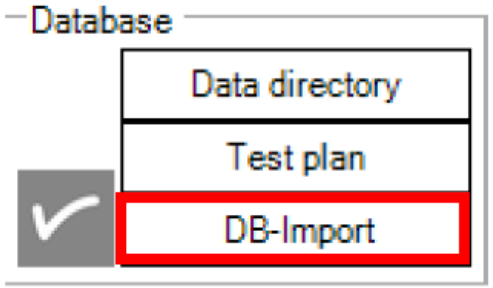
VALIMAT® - Template database



Setup the folder containing the template database under the settings tab



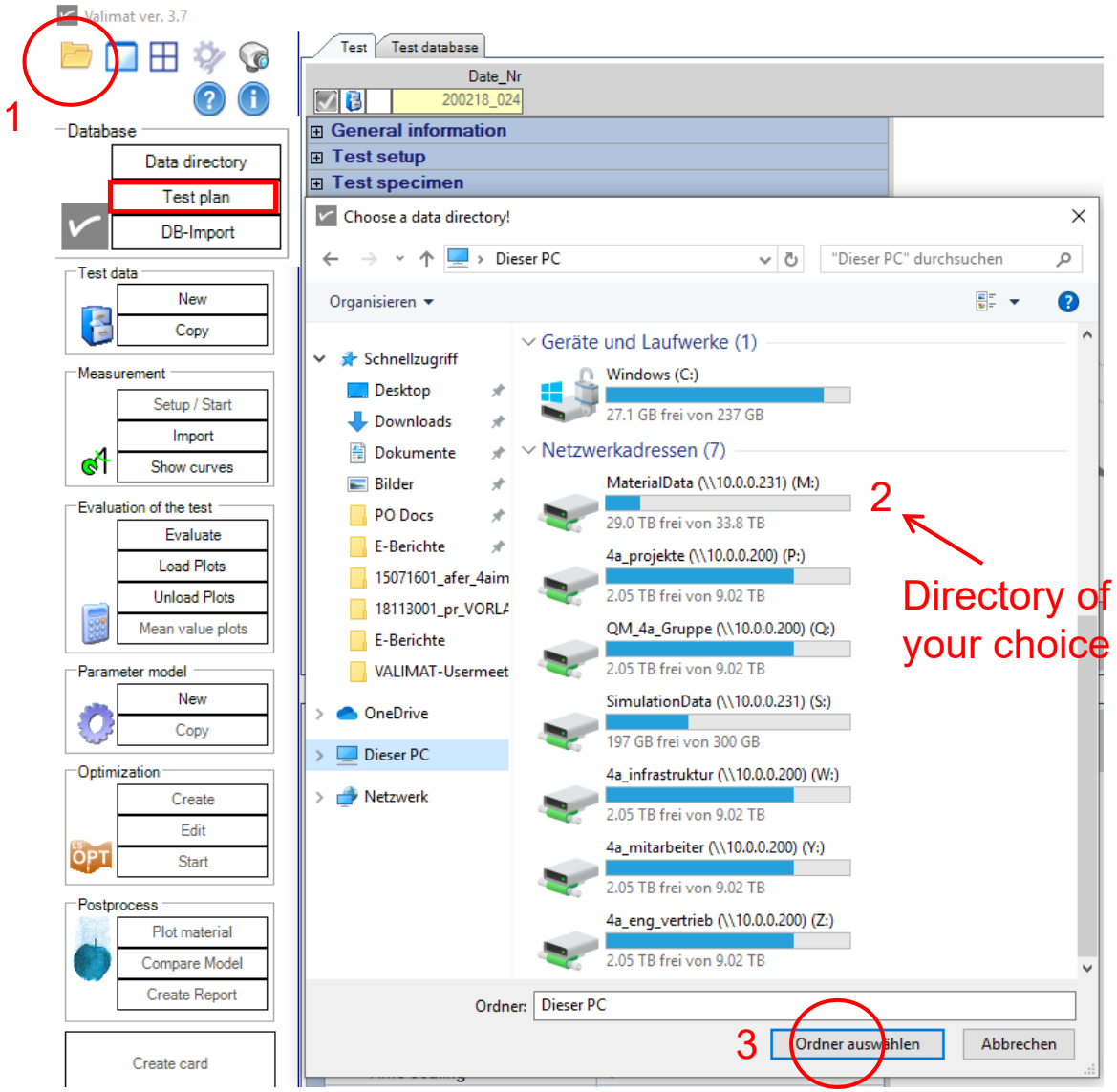
A template database can be imported using the `Test plan` button



An additional VALIMAT® can be imported in the already opened database

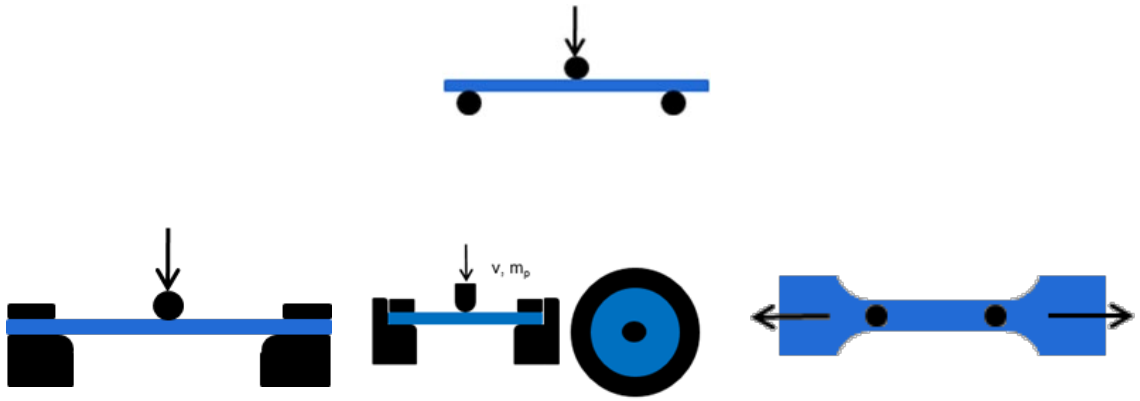
VALIMAT® - Template database

- To use the template database, you have to create it once → 4a provides you with an example template database
- The following steps need to be performed
  - Create a directory where you store tests and models
  - Create a new (empty) database in this directory



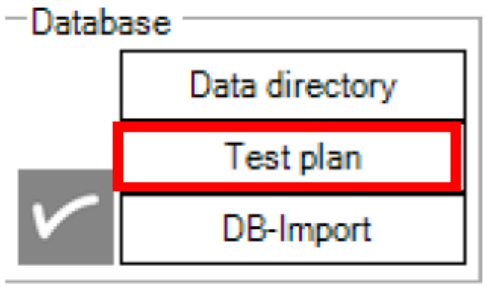
VALIMAT® - Template database

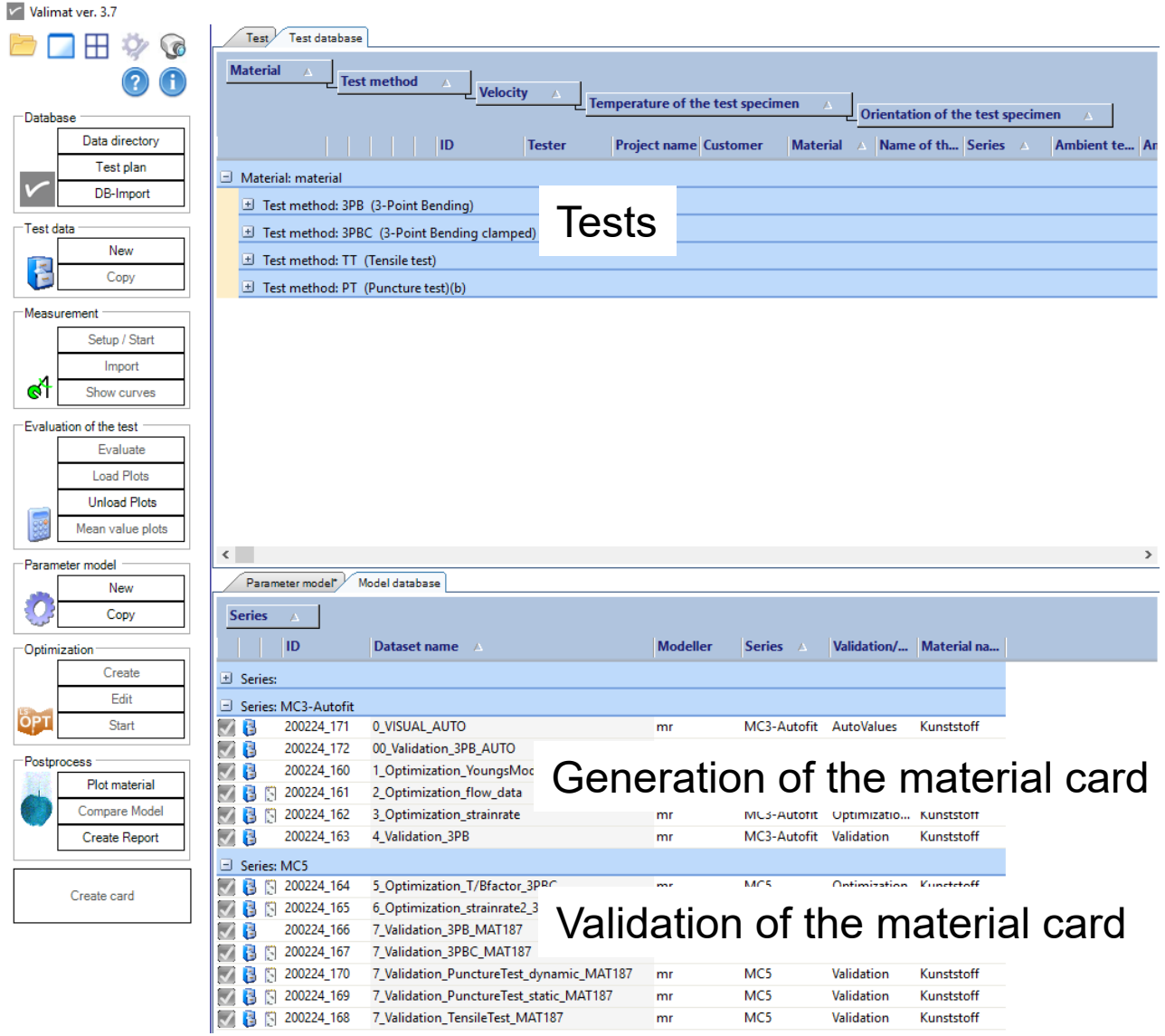
- The use of a template database streamlines the workflow of generating material cards from the tests conducted under the different loading conditions
- It is especially useful, when the test setups for the optimization or validation of the material cards are the same, as shown in the test package overview in the previous slide
- As a demonstrative example, we will go through the template database for the material package isoP standard
  - The material package uses static and dynamic bending tests to generate the material card.
  - Dynamic puncture, clamped 3-point-bending and tensile tests to validate the material card.



VALIMAT® - Template database

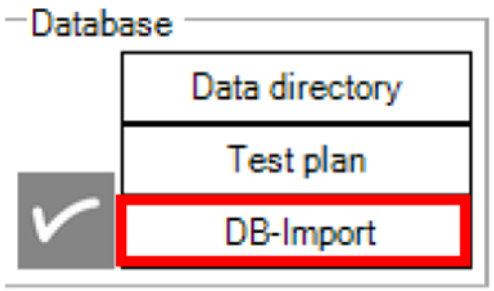
- The template database made available for the isoP standard package is shown here.

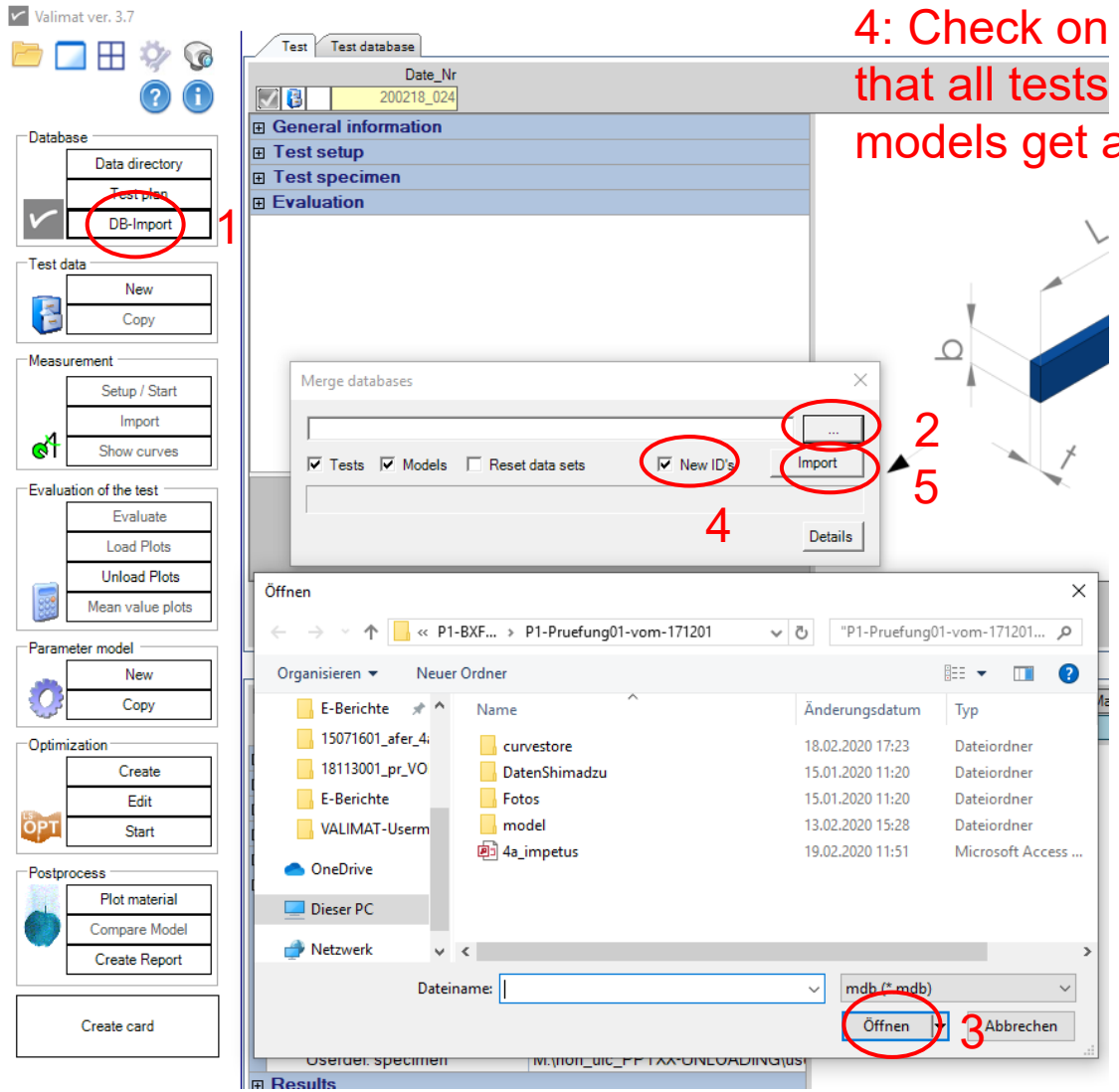




VALIMAT® - Template database

- As an alternative, you can also import the template database in an already existing database by following these steps





4: Check on this box so that all tests and models get a new ID !!!

VALIMAT® - Template database

- Advantages of the template database
  - The test setup is already stored
  - The models for creating the material card are already stored
  - The test IDs in the models are linked to the tests
- Checks that need to be carried out before calculation using the database created from the template database
  - Update the test specimen names and geometry (e.g. pendulum mass, gauge length)
  - Check the length of the test curves in the models
  - Optimization of Youngs modulus → trim test curve to obtain a suitable length for the optimization
  - Optimization of plastic data and strain rate dependency → optimization curve should be a little over the force maximum
  - Check the starting values and limits of design variables
  - Check if the right test IDs are linked to the models

Automatic report generation

- Requirements
  - A testing database with correct values in the following fields

ID	Project name	Customer	Material	Series	Thickness	Width	Length	Temperatu...	Mass of the pendulum	Velocity	Distance of support...
140313_001	Ringversuch	4a engineering GmbH	PP LGF30	longitudinal	1.8	10	50	23	1466	1	39.89
140313_002	Ringversuch	4a engineering GmbH	PP LGF30	longitudinal	1.81	9.97	50	23	1466	1	39.89
140313_003	Ringversuch	4a engineering GmbH	PP LGF30	longitudinal	1.82	9.99	50	23	1466	1	39.89
140313_004	Ringversuch	4a engineering GmbH	PP LGF30	longitudinal	1.82	9.98	50	23	1466	1	39.89
140313_005	Ringversuch	4a engineering GmbH	PP LGF30	longitudinal	1.8	9.99	50	23	1466	1	39.89
140313_006	Ringversuch	4a engineering GmbH	PP LGF30	longitudinal	1.82	10	50	23	1466	1	39.89
140313_007	Ringversuch	4a engineering GmbH	PP LGF30	perpendicular	1.82	9.97	50	23	1466	1	39.89
140313_008	Ringversuch	4a engineering GmbH	PP LGF30	perpendicular	1.81	9.97	50	23	1466	1	39.89
140313_009	Ringversuch	4a engineering GmbH	PP LGF30	perpendicular	1.83	9.98	50	23	1466	1	39.89
140313_010	Ringversuch	4a engineering GmbH	PP LGF30	perpendicular	1.82	9.99	50	23	1466	1	39.89

  - A model database with correct values in the following fields

Material name
Series

ID	Dataset name	Material name	Series
Material name:			
Material name: PPLGF30			
Series: longitudinal			
140318_002	Young's Modulus	PPLGF30	longitudinal
140318_003	Plastic Data	PPLGF30	longitudinal
140318_004	Strain Rate Dependency	PPLGF30	longitudinal
140318_005	Validation	PPLGF30	longitudinal

  - Powerpoint templates

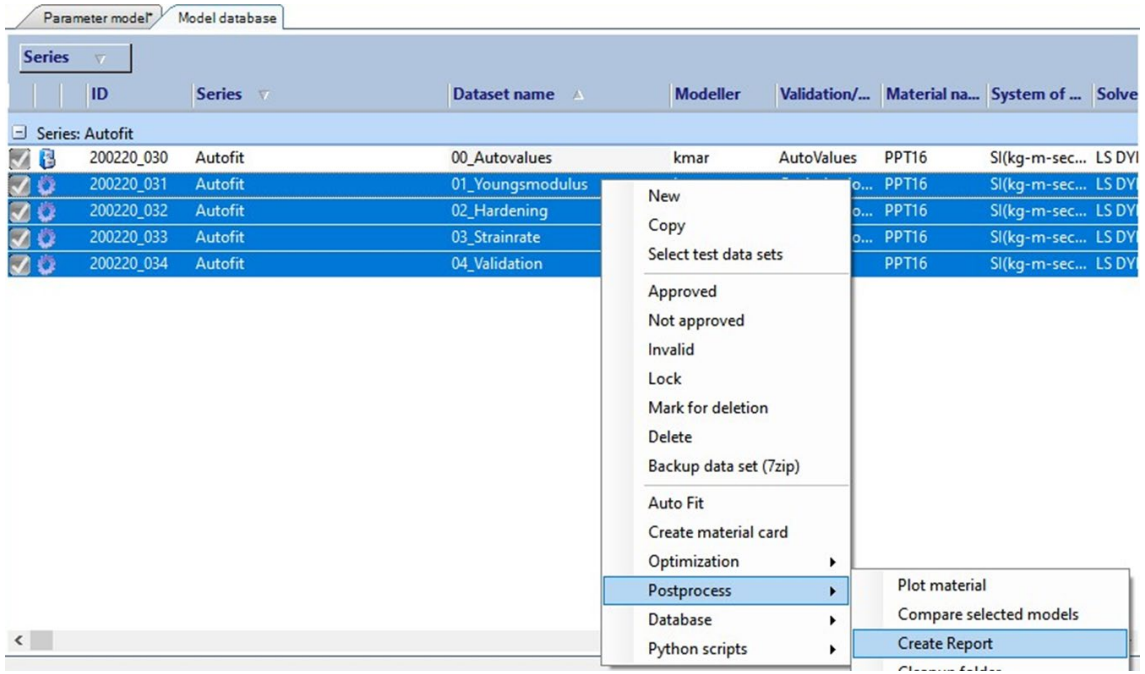
Automatic report generation

- Generation of a template
  - You can of course generate template of your own
  - It must be a .PPTX
  - There are several possibilities to choose from
    - <<img_sc_F(s);auto;legend_off>> : image of the simulation curve force vs. displacement with auto scaling and without a legend
    - <<img_sc_F(s);0;0.002;0;1000>> : image of the simulation curve force vs. displacement with scaling from 0 to 0.002 m and from 0 to 1000 N
    - <<img_sc_sig(eps);auto;legend_off;sc_only>> : image of the simulation curve stress vs. strain with auto scaling and without a legend; just the simulation curves are displayed (without the test curves)
    - <<img_tc_v(t)>> : image of the test curve(s) velocity vs. time with auto scaling
    - <<img_tc_F(t);xmin;xmax;ymin;ymax>> : image of the test curve(s) force vs. time with the scaling xmin to xmax for time and ymin to ymax for force; the values have of course to be replaced

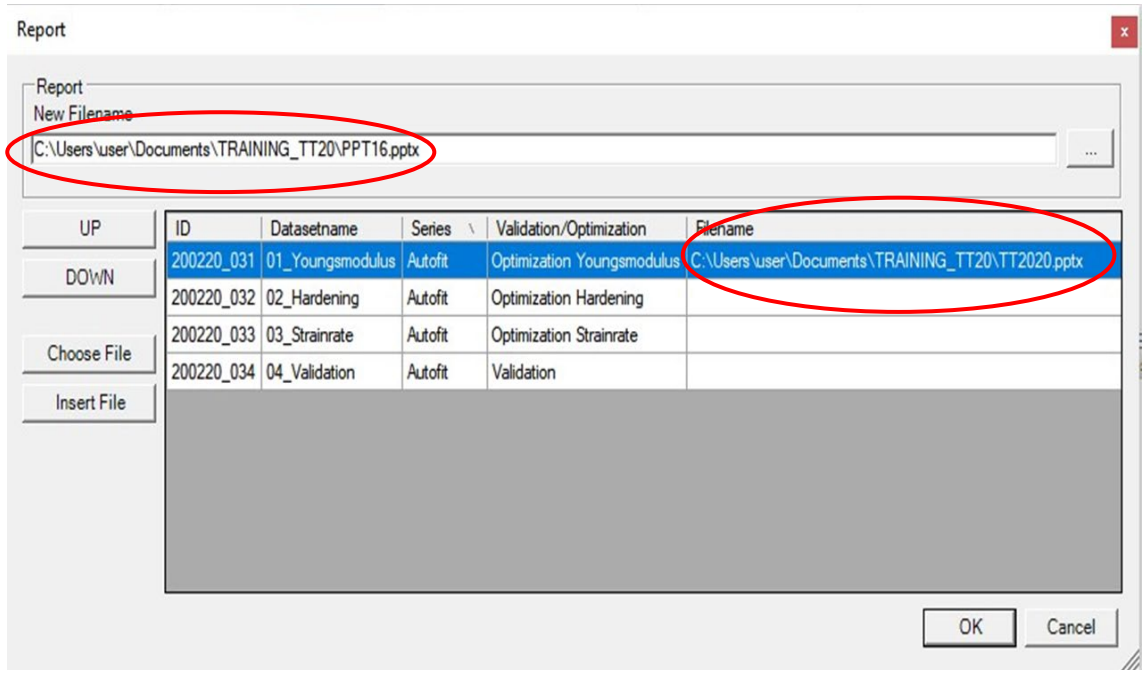
Automatic report generation

- Test curves are optimized using VALIMAT® and then exported to Powerpoint

Template



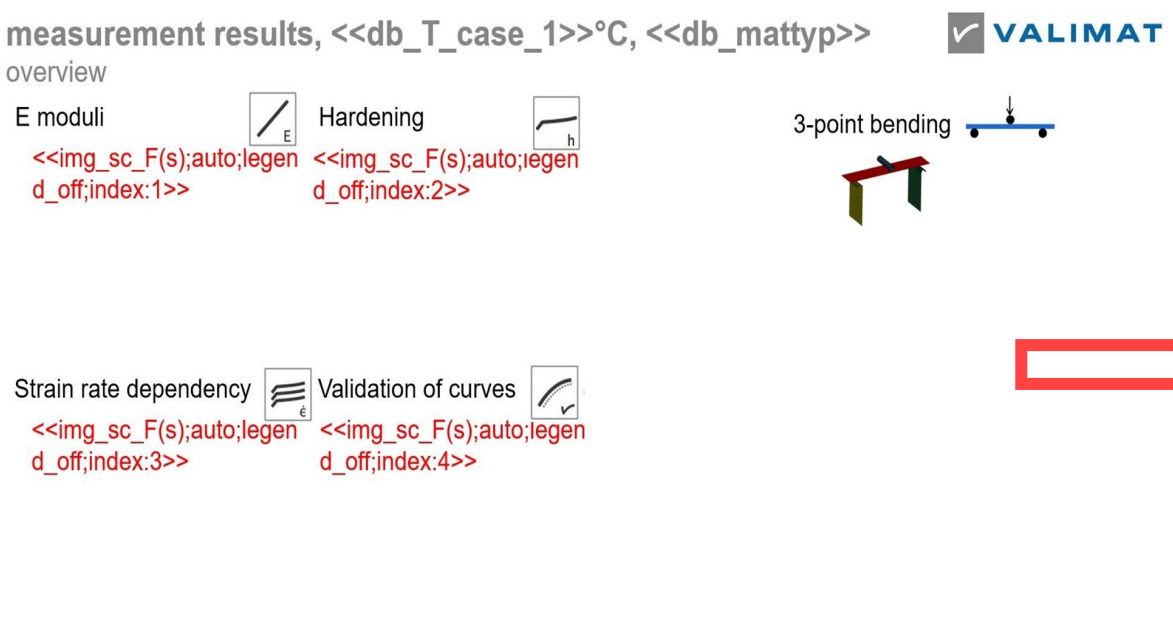
Generated report



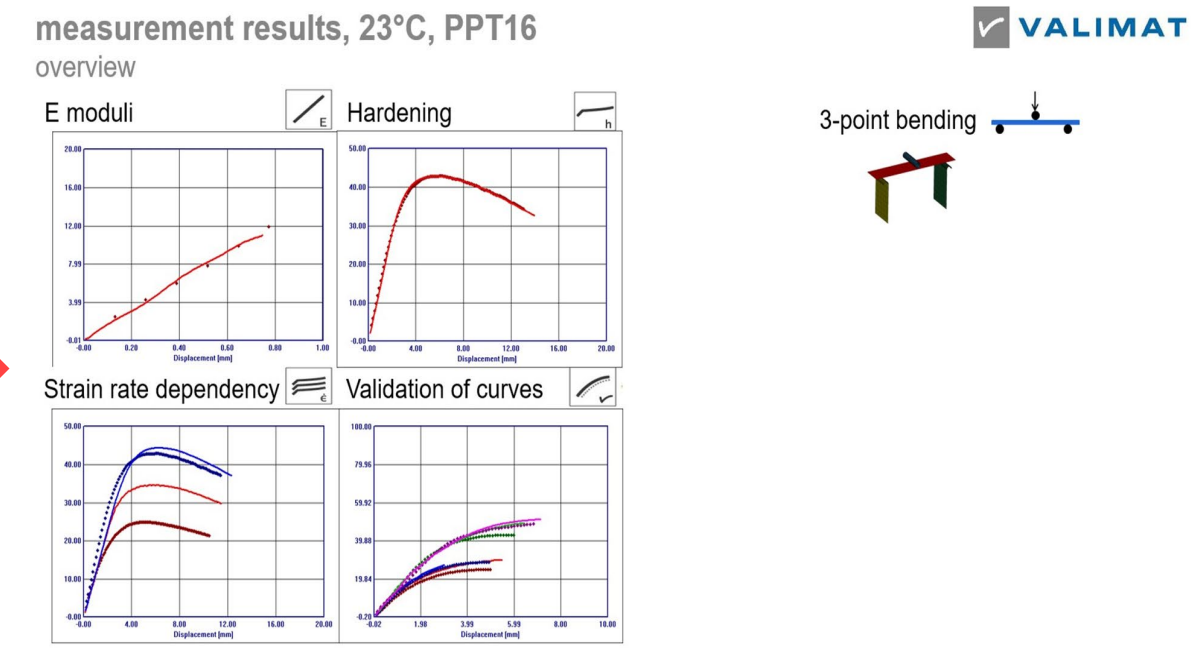
Automatic report generation

- Templates are needed to generate an automatic report

Template



Generated report



Automatic report generation

- Quasi-static and dynamic 3-Point bending tests are exported to a Powerpoint

Template

Reverse engineering, <<db_mattyp>>, <<db_T_case_1>>°C

3-point-bending tests

VALIMAT

<<img_sc_F(s);auto;legend_off>>

Case	v_0 [m/s]	l_w [mm]	$m_{Pendulum}$ [g]	b [mm]	t [mm]	l [mm]
<<case_1>>	<<db_va>>	<<db_lw>>	<<db_mp>>	<<db_b;f2>>	<<db_h;f2>>	<<db_l;f2>>
<<case_2>>						
<<case_3>>						
<<case_4>>						
<<case_5>>						

♦♦♦ Mean value curves testing

— optimization curves simulation

model <<db_modell_id>>
solver: <<db_solver>>, material card: <<db_mat_file>>, element size: <<db_elsize>>mm,
element type:<<db_elform>>, through thickness integration points: <<db_ellayer>>
assumptions: Poisson's ratio: <<db_nue>>, friction coefficient: <<db_fr>>

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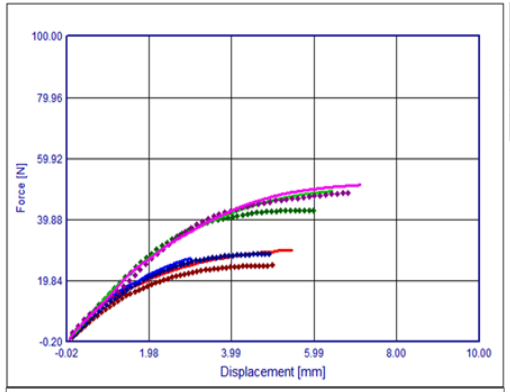
P. Reithofer, A. Fertschej, K. Girz, rep_18032001_pr_afer_sia_GB477HP+H702 IN PHYSICS WE TRUST

Generated report

Reverse engineering, PPT16, 23°C

3-point-bending tests

VALIMAT



Case	v_0 [m/s]	l_w [mm]	$m_{Pendulum}$ [g]	b [mm]	t [mm]	l [mm]
stat_low_vel_VP	0.0001	40.01	0	10.02	2.42	50.19
stat_high_vel	0.001	40.01	0	10.03	2.42	50.20
dyn_low_vel_EL_HC_VP	1	40.03	1580	10.03	2.42	50.18
dyn_high_vel	4	40.03	1580	10.02	2.42	50.20

model 200220_034
solver: LS DYNA, material card: *MAT_PIECEWISE_LINEAR_PLASTICITY (*MAT_024), element size: 2mm,
element type: 16: Fully integrated shell element (very fast), through thickness integration points: -1
assumptions: Poisson's ratio: 0.3, friction coefficient: 0.1

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Automatic report generation

- <<img_mc_1>> : material curve (stress-/strain curve (1) or flow curve (2))
- <<db_mattyp>>, <<db_lw>>, … all variables (according to the 4a impetus manual)
- <<db_T_case_1>> : Temperature of case_1

Case name	v_0 [m/s]	l_w [mm]	$m_{Pendulum}$ [g]	b [mm]	t [mm]	l [mm]
<<case_1>>	<<db_va>>	<<db_lw>>	<<db_mp;4>>	<<db_b;f1>>	<<db_h;f2>>	<<db_l;f1>>
<<case_2>>						
<<case_3>>						
<<case_4>>						

- For the table just the first row has to be filled out. “f1” means just one digit after the comma, “f2” analogue two digits after the comma; “4” means over all four digits.
- This formatting can also be used on the other variables outside the table.
- The image has the size of the text field set.

Automatic report generation

Live demonstration!

Autofit → Report (workflow)