Overview

Property	Short description	Details	Limitations	remarks
winLIFE BASIC	Basic fatigue analysis for proportional load case		Only 1 loading	
winLIFE MULTIAXIAL	Multiaxial fatigue: critical plane approach		Max. 200 loading	This module is needed in addition to winLIFE BASIC
winLIFE Gearwheel and Bearing	It is recommended to use it together with the ZAR-software of HEXAGON	Module needs very special knowledge of gearwheel design. Typical users are in the automotive area.		This module is needed in addition to winLIFE BASIC
User interface	interface which meets Windows standards	- Each project in one window allows parallel working projects - Masks for input/output with detailed description the parameters - Data tree for fast access for power users - Detailed Online-Help-function		
Documentation	Printed Manual with more than 500 pages in English and German language			All import and export data files are explained in detail
Installations	Single-user with hardlock Network-license with hardlock Terminal server with hardlock	1 hardlock each computer 1 hardlock on a server, installations on each client winLIFE only is installed on a terminal server where it is executed. winLIFE works only on the terminal server where the hardlock is located. No installation on the client is necessary		
Training	Video examples in the internet and on the winLIFE-CD	http://www.stz-verkehr.de/tutorial_de.htm	There are 13 video-examples showing the use of winLIFE	You need the software Windows Silverlight (free download from Microsoft if not already available)
Seminars	2 day lectures 3 times a year	http://www.stz-verkehr.de/e_semi.htm		Lectures in English possible anywhere in the world (according to demand)
customers	Automotive Civil Engineering Windturbines Ship Education			

Details

Type of analysis	FEA-Superposition of static FE-Load cases with load time histories	The static result of stress tensor, the static load is used for superimposing with load time histories	Max. 200 static FEA-Load cases possible.	
	Transient analysis from FEA or MBS	Stress tensor time history is read from FEA and used for fatigue analysis.	Max. 10 000 nodes	
	Using measured strain data	Flexible import of nearly all kinds of strain gauge rosettes data		
	Stand alone operation without FEA connection	“Classic” fatigue calculation for one point without FEA		
FEA software usable with winLIFE	ABAQUS ANSYS FEMAP (NxNASTRAN NEiNASTRAN) MEDINA SAMCEF	The data transfer happens by an export 7 import file		
Fatigue calculation methods	Nominal stress: (S-N- curves, can be transformed to any failure probability), temperature influence to the S-N curve is considered for any failure probability	approaches for Miner rules: - original, elementary, according to Haibach, Liu-Zenner - Mean stress correction by S-N-curve transformation or amplitude transformation		
	Local stress: (S-N-curves, can be transformed to any failure probability), temperature influence to the S-N curve is considered for any failure probability	Equivalent stress definition: - normal stress - Tresca - mod. v. Mises - Findley		
	Local strain approach (e-N- curves) 50% failure probability	Damage parameters: Smith Watson Topper, Bergmann, Socie, Fatemie Socie Neuber: original, according to Sonsino		Interactive animation of stress train path and Neuber rule for education
Loading can defined by	load time history (max 200 in multiaxial case for each project)	Single load step can be entered manually Sinus-Load-Generator File containing history (got from measurement)		
	Load spectrum	Spectrum can be entered manually Spectrum generator for often used spectra available.		
	Rainflow-Matrix		Maximum 500 classes	Different procedures to consider the residuum
	Torque and speed history (gear wheel) load and speed history (bearing)	Residence time count is performed		
Load split for rotating components	The measured load is divided into several split loads for each rotation.	The load split enables the fatigue calcualtion of rotating parts by superposition of unit load cases.		
Classification methods	Rainflow Range Mean Pair count Range pair count Residence time count (Gearwheel, Bearing) Level crossing	Different procedures to consider the residuum available Range Mean Pair count with or without mean influence		

Creating S-N-curves from static material data	Hück, Trainer, Schütz			
	Haibach			
	FKM	Full FKM- database is available		
	GL (ship building)			
	GL (wind energy)			
Creating e-N-curves from static material data	UML			
	Universal slopes			
	Modified universal slopes equation			
Material database	Full FKM database and more than 1400 strain life data are shipped with the program on CD			
Seam welds	Nominal stress (FKM)			
	Nominal stress GL (ship, windturbines)			
	Structural concept GL (ship building), FKM, Marquis			
	R1-concept	User has to create a suitable FEA mesh and to define his S-N curve.		
Spot welds	Not available			
Special Modules	Gearwheel	Flank and root life curve generator available.	Special parameters of the design of the wheels must known.	Connection to Hexagon software available and recommended.
	Bearing	Calculation based on the life data of the manufacturer		
Batch Procedure	batch procedure can be used to define a calculation stream	A batch process can be simply created by the user- interface or manually by a script.		
External call of winLIFE	You can start winLIFE from the shell or from other programs with parameters	An integration in a batch process together with other software (FEA, optimisation, driveline-simulation is possible. And helps to automate the calculation procedure especially in the case of huge structures.		
Superposition	Single projects can be superimposed	Those types of open projects which lead to the same type of classification (e.g. Rainflow, residence time count) for fatigue life calculation are proposed for superposition. It is checked automatically if the conditions are met (Number of classes, width, etc).		
Extrapolation	An extrapolation (of one project) is possible			

Result presentation - one project		- Protocol file - Results of classification methods - Mohrs circle for each time step - equivalent stress history for each plane - angle of 1st principal stress for each time step - relation of 1st and 2nd principal stresses - damage equivalent rectangle stress - S-N curve including load amplitude and damage - Haigh-diagram including load and damage - Rainflow-Matrix including damage - Range Mean Pair count including damage - Exportfile for data transfer to FEA (simple to use ASCII file)		
- Project management	Up to 1000 parallel projects	The graphs of many projects can be shown in one graphic for the comparison		
- Project generation	Automatic generation of projects for parameter analysis			
- Load Influence Analysis	Automatic analysis of the meaning of each loading for fatigue life	Load combinations are varied and their influence to damage is calculated		
Data Manipulation	Load data can be manipulated interactively: - removing a drift, - multiplying and/ or adding a value, - removing spikes - modifying Rainflow-counts			
Graphics design	The user can change all the graphics easily so that he can analyse them and use for his technical report			
Export of graphics for later use	1.) Export of each graphic into the clip board 2.) Export into a *.png-file			
Report	Creation of pdf-report	User can create a selection of the elements of the report. All graphics available can be included and are automatically created in the user defined report.		