

# MDESIGN

DIGITAL CONTENT FOR ENGINEERING

2020  
Second Edition

## MODULE **OVERVIEW**

- FORMULARY
- TABLES AND DATABASES
- CALCULATION LIBRARIES

## Tolerances and fit

- ISO-Fit system
- Tolerance calculation

## Moments, approximate values

- Approximate calculation of the roughness dimension
- Manufacturing technique of the surface
- Calculation and conversion of hardness values
- Moments of inertia of the area, mass moments of inertia

## Shafts, axes, beams

- Recesses, DIN 509
- Designed diameter for axes and shafts
- Snap rings for shafts
- Reduced shafts
- Grooved shafts
- Crossed bored shafts
- Parallel key notches
- Splined shaft notches

## Connections

- Forces on the bolt
- Riveted joints
- Soldering joint
- Design of prestressed boltings

## Surface pressure

- Hertzian pressure
- Surface pressure
- Surface pressure for serrated profile
- Surface pressure for conical press-fit joints

## Gears

- Layout of gear pair

## Geometry

- Axial moments of inertia of an area
- Torsional moments of inertia of an area
- Axial mass moments of inertia of bodies
- Cross-section properties
- Geometry determination of surfaces and bodies
- General tolerance

## Hydraulics

- Sealing-surface pressure acc. to DIN/EN
- Wall thickness against inner pressure
- Hydraulic press
- Viscosity, ISO normal oils
- Cylindrical shells
- Compression load, buoyancy in liquids
- Pumping capacity
- Shape of flow
- Flow velocity and inner pipe diameter
- Pressure loss in pipeline elements
- Hydromotors, hydropumps

## Manufacturing methods

- Metal-cutting
- Deep-drawing, bending forming
- Main machine time and cutting speed
- Partition of lengths
- Full forward extrusion presses

## Pneumatics (online)

- Amount of water in the air
- Compressors
- Piston speed, piston force, buckling force
- Reynolds number
- Inner pipe diameter and required delivery output
- Flow factor of valves
- Air consumption

## Physics

- Mechanics of deformable bodies
- Hydrostatics and hydrodynamics
- Kinematics
- Dynamics
- Gravity
- Rotational movement of rigid bodies
- Damped mechanical oscillation
- Undamped mechanical oscillation (harmonic oscillation)
- Superposition of mechanical oscillation

## Statics

- Buckling of rods
- Buckling loads and buckling lengths
- Statically determinate beam
- Statically indeterminate beam
- Thermal expansion and calculation of elongation
- Round plates
- Beam resting on elastic support
- Friction on the bearing / ring pin
- Stress concentration
- Pressure between elastic bodies
- Frames
- Equivalent stress

## Dynamics

- Dynamic stress in a tightrope
- Stress of a beam as a result of shock loading
- Stresses in a beam
- Torsional stress in the shaft
- Forces on hoisting devices
- Mechanical power at rotary motion
- Shearing strain
- Inclined plane
- Efficiency factor, total efficiency

## Shells of revolution

- Cylindrical shell and conical shell
- Spherical shell
- Toroidal shell
- Cylinder shell, bending and membrane stresses
- Partial spherical shell
- Long conical shell with edge loads
- Cylindrical shell with open and closed ends
- Thick-walled cylinder under internal and external pressure
- Thick-walled sphere under internal and external pressure

## Parameter studies

- Automatic serial calculations
- Variant analysis

## Documentation

- Disclosure of formulary and reference work
- Output and input format XML
- Output format PDF/A - compliant long-time format acc. to ISO
- Output format RTF (WORD compatible)
- Output format HTML
- Output format DXF/SVG (depending on module)
- Output format 3D - models in STEP format
- Data exchange via Windows clipboard
- Document support for 3D display (Acrobat Reader)
- User interface and documentation German and English  
Result documents optionally also in Russian, Italian, French, Chinese

## Information - online

- Access to manufacturer and supplier information

## Shafts, axles, beams

- Shaft calculation acc. to DIN 743 (basic calculations)
- Statically determinate and indeterminate beam, Mott\*
- Shaft, ANSI\*
- Column analysis and design\*
- Combined stresses and Mohr's Circle\*
- Beam (with 3D Model and STEP export)

## Shaft hub connections

- Splined shaft connection
- Parallel key connection
- Split hub and split lever hub
- Tapered connection
- Clamping device joint
- Axial bracing
- Cylindrical press-fit connection (with 3D Model and STEP export)
- Serrated shaft
- Polygon profiles P3G and P4C
- Parallel key, Mott\*
- Woodruff key\*

## Bolts and pins

- Crossbolt
- Guiding pin, longitudinal pin, transverse pin

## Screw connections

- Calculation of bolted joints acc. to VDI 2230 (basic calculations)
- Power screw
- Moment loaded joint
- Bracket connection
- Bolt specification and bolted connection\*
- Power screw, Mott\*

## Gearings

- Cylindrical gear, gear rack (with 3D Model and STEP export)
- Cylindrical worm gear, bevel and hypoid gear
- Spur gear, helical gear, bevel gear, worm gear, AGMA\*
- Spline, ANSI\*

## Belt-, chain drives

- Synchronous belt and belt contact
- Normal V-Belt, narrow V-Belt
- Roller chain
- V-Belt, Mott\*

## Roller bearings

- Ball and roller bearing (basic calculations)

## Plane bearings

- Axial and radial plain bearing
- Plain bearing, Mott\*

## Elastic springs

- Compression spring, tension spring
- Torsion spring and torsion bar spring
- Disc spring
- Helical extension\*, helical compression\*, helical torsion\*

## Welded connections

- Weld calculation acc. to DVS
- Welded joint, Mott\*

## Bonded joints

- Bonded joint - tensile and tangential load, torsional loaded

## Clutches and brakes

- Clutch, brake
- Plate type\*, cone\*

## Sealing

- O-ring

## Linear technology

- Linear guides, ball screw

## Plant

- Flanges (AD 2000)

## MDESIGN technology

- Material data - Consideration of FKM guideline
- General strength assessment acc. to FKM guideline

## MDESIGN bolt (extension to MDESIGN mechanical)

Bolted joint acc. to VDI 2230

- Consideration of eccentrically applied axial load
- Definition of company specific bolt geometries
- Hollow screws, flange screws, pin screws, stud bolts
- Calculation of screws in inch dimensions (UNC, UNF, UNEF)
- Clamping with up to 10 clamped parts
- Consideration of temperatures
- Individual material database for own materials and bolt dimensions
- Additional FKM material database
- Spring washers and safety nuts
- Possibility of transferring forces from FE results
- Extended level of detail of the plates
- Dynamic tension diagrams with tolerances

Bolted joint acc. to Eurocode 3

## MDESIGN multibolt

- Load distribution on multi bolted joints
- Free flange and connecting design as well as screw placement
- Determination of the highest loaded screw
- Export of STEP model data

## MDESIGN shaft (extension to MDESIGN mechanical)

Shaft calculation and strength verification according to DIN 743

- Hollow shafts and vertical shafts
- Conical shaft fillets
- Up to 50 shaft fillets and up to 12 bearings
- Individual notch factors
- Critical bending shaft speed values
- Result-dependent graphical evaluations
- STEP data exchange with other systems

Strength verification acc. to FKM guideline

- STEP data exchange with other systems
- Integrated FE solvers and automatic grid generation
- Graphical evaluation possibilities

## MDESIGN bearing (extension to MDESIGN mechanical)

- Bearing combinations
- Nominal and modified reference life expectancy (DIN 26281/ISO/TS 16281)

## MDESIGN gear (extension to MDESIGN mechanical)

- Cylindrical gear (AGMA), tooth flank fracture (3D Model and STEP export)
- Ring gear with rim influence (with 3D Model and STEP export)
- Plastic gears (with 3D Model and STEP export)
- Bevel gears and hypoid gears (AGMA, DNV GL)
- Gearpair micropitting
- Crown gear

## MDESIGN gearbox

- Shaft-bearing-gear assemblies
- Mass, volume and inertia optimized gearboxes

## MDESIGN LVR / LVRplanet

- Load, pressure, cyclic tooth root stress and temperature distribution for spur gear and planetary gear stages
- Double helical gears
- Planetary with 2 planets

## MDESIGN weld (extension to MDESIGN mechanical)

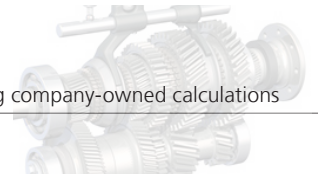
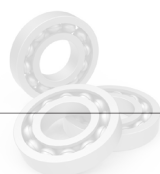
- Weld calculation acc. to FKM guideline and Eurocode 3

## MDESIGN espresso

- Pressure vessels (AD code and EN 13445) (AD 2000, DIN V 2505)
- Flanges (AD 2000, DIN V 2505)
- Flange ends, plates

## MDESIGN author

- Authoring system for integrating company-owned calculations



# MDESIGN

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