New concepts in mechanical engineering

As the leading French player in the fields of mechanical engineering innovation and R&D, Cetim has built up a wide network of partners. Its engineers and technicians operate in more than 30 countries each year.

R&D function is carried out either within specific sectors or cutting across sector boundaries, and within either a national or an international context.

Cetim provides a comprehensive array of services to the mechanical engineering industry from consulting to testing and from engineering to training in new skills.

Cetim is a member of the Carnot institutes network.

Nantes, France

Senlis, France

Saint-Étienne, France

Cobra
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The strength of the world leader
for bolted joint design and failure analysis

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La recherche
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Bolted joints analysis, review, verification and dimensioning, with controlled torque pre-tightening, following VDI 2230 recommendation (and extensions to standards NF E 25030-1, NF E 25030-2):

› Benefit from CETIM's expertise in bolted joint design and verification in the analysis of your assembly
› Improve your understanding of complex assemblies with the best validated software on the market
› Deliver reliable documentation with your validation report including design options
› Reduce verification and design time of complex assemblies
› Perform strength analysis beyond VDI 2230 recommendation

› Engineering, design support
› Tests, simulation
› Consulting, expert's analysis, Training

MADE & VALIDATED by Cetim

APPLICATION DOMAINS

COBRA is used in the industry to address complex bolted and screwed joints with critical safety and security issues

› Major companies of the transportation industry (automotive, rail, air, defense and space) use COBRA to analyse dynamic assemblies
› COBRA is widely used across the industry (gas, petroleum, agriculture, construction) for the design and analysis of heavy duty assemblies

UNIQUE FEATURES

Cetim has a unique experience in bolted and screwed joints verification and failure analysis. From this experience, CETIM has developed design and analysis functions beyond those of VDI 2230

› Improved computation of alternate stress for dynamic loading, accountable for 80% of failures in bolted joints
› Unique computation of geometry and tolerances, thread tolerances and material properties dispersion, tightening tool and friction coefficient dispersion for static loading validation
› Selection of appropriate torque level to support the design of complex bolted joints

WHY SELECT COBRA

Benefit from the experience of a world leader in bolted joint verification and failure analysis.

› 30 minutes design and verification time for a complex assembly ➔ Hand calculations or verification with other tools usually take days
› 100% focused on operational data and production ➔ takes into account installation error and data dispersion
› 100% validated: continuous verification of data compliance/validation ➔ CETIM is the only software editor with laboratory testing facilities
› 100% dedicated to the industry ➔ Cetim is the only software editor « managed» by the industry
› 450 experts able to provide support sessions in addition to onsite training ➔ Cetim is the only editor with recognized field expertise

SCOPE OF APPLICATIONS

› Mechanical and/or thermal stresses
› Fastener geometry (screw, stud, threaded rod, nut, washers…) and its mechanical properties. Threads ISO, UN, UNR.
› Clamped part geometry
› Tightening conditions, method, friction coefficients, limitations, etc.

The software can determine the optimum tightening conditions taking into account:

› The dispersion of the tightening process (material + tools + operators)
› The friction coefficients (under head or nut and in the thread)
› The risk of surface embedding
› The mechanical stress in the screw (tensile + torsion + bending)
› The failure load of the threads
› The presence of self-locking elements or prevailing torque (locknuts, tight fitting parts)

Once the calculation is performed, the software provides the following information:

› Load factor
› Dynamic stress range
› Stress distribution in the assembly
› Tightening method (torque, torque + angle, tensioning…)
› Minimum thread engagement

EXPERIENCE RETURN

Specific data bases are provided:

› Materials (Re, Rm, E, thermal influence)
› Screws, nuts, washers (diameter, length, property class, screw head size)
› Standard holes (fine series, medium, large)
› Standard torque

COMPUTATION RESULTS

› Resilience (or stiffness) of the fastener and the clamped parts
› Dynamic stress (fatigue resistance)
› Minimum tightening force to prevent opening and/or sliding
› Maximum allowable preload
› Minimum and maximum achieved preload
› Minimum required properties of fastener, when quality class not defined
› Elongation of the fastener after tightening
› Maximum stresses in the elastic washers
› Bearing pressure on contact surfaces (risk of embedding)
› Minimum threaded length (risk of thread stripping)
› Tightening settings determination (torque, angle, tension, etc.) depending on:
  - tension in the screw
  - bearing pressure on the different contact surfaces
  - failure load of threads
  - required and/or a prevailing torque (on first tightening)