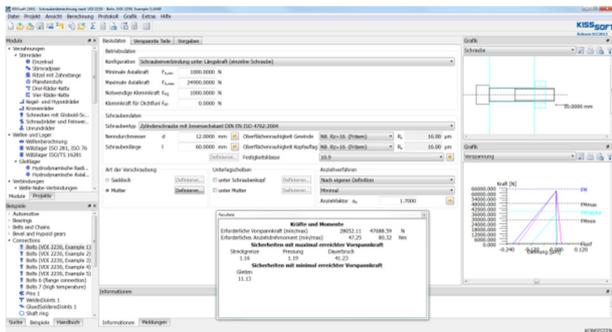# KISSsoft Calculates Bolted Joints

In the KISSsoft system, bolted joints can be calculated using the entire content of VDI 2230 (Issue 2015) and other supplementary calculation methods used in the industry.

In addition to the report, the clamping diagram, assembly preloads, and bolt geometry are shown in graphics.

Calculation according to VDI 2230 (Sheet 1)

- Individual bolted joints
- Results for all safeties
- Various other diagrams for clamping, etc.

Loads for individual bolts or flange connections are specified with predefined operating types. The clamped parts can be defined as plates, sleeves, ring elements and prismatic bodies. The calculation is performed with the predefined tightening torque or preload. Eccentric clamping and load are also possible.

Calculation according to VDI 2230 (Sheet 2)

- Multi-bolted joints
- Calculation according to FE Class II and III
- Interface to ANSYS Workbench Tool

For multi-bolted plate joints, you can define bolts in any position which is subject to shearing force, a bending moment in two directions, and a torsional moment. The load distribution on the bolts is calculated on the assumption that rigid plates are connected by springs at the bolt positions. You can enter a stiffness coefficient to represent different bolt diameters.

You can enter the bolt positions in a table or load them from a file. The resulting axial forces, and the clamp loads required to transmit shearing force, are also displayed in the table.
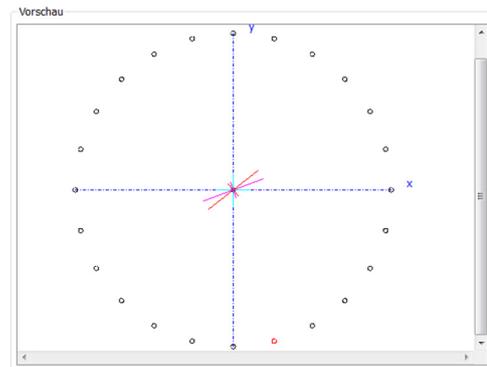
Integrating FE results

Among other things, the addition to Sheet 2 contains the calculation procedures needed to include FE results in the calculation. Model classes II and III are available in the KISSsoft system.

To simplify and automate the calculation process between FE methods and analytical calculation, CAD-FEM has made a newly developed tool available. This uses the workloads and part geometries to determine the forces and perform the calculation proof in the background, with KISSsoft. This tool, called "WB/Bolt Assessment inside ANSYS" is available from CAD-FEM.

ANSYS

200.00 (mm)
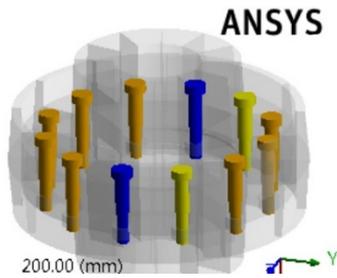
It is also possible to carry out the calculation by entering the forces in the KISSsoft system, independently of ANSYS Workbench Tool.

Calculation options

- Extensive, expandable databases
- Own calculation procedures can be integrated
- Manual and documentation

KISSsoft includes extensive databases for bolt geometries, materials etc., which you can extend by adding your own data. You can also extend the report templates by adding your own calculation procedures. The product is rounded off by detailed documentation with a manual and graphics.

Own additions

In addition to providing tables with standard values, the program also has a range of options that enable you to enter your own definitions for most of the constraint values such as geometry and material data. These integrated tables cover all the affected elements, such as bolts according to DIN EN ISO 4762, 4014, 4017, 1207, 8765, 8676, DIN EN 1662, 1665 and ASME B18.2.1, standards for bores, washers, nuts etc. You can also enter your own definitions for bolts of almost unlimited complexity – including hollow bolts.

You can also define your own calculation algorithms in the KISSsoft bolts report template. This enables you to perform company-specific proofs or supplementary calculations directly In the KISSsoft system, making parallel analysis superfluous.

Safeties for operating forces

When analyzing bolts as defined in VDI 2230, the safety factor which is usually required in other strength calculations is missing. Despite this, a "utilization" is calculated and used as a result, to enable a proof of how well the bolt is dimensioned, with regard to its operating forces, to be produced.

The utilization in % indicates the size of the ratio between the required preload FMMax and the effective possible preload force FM. The formulas used here are not specified in VDI 2230 and are therefore included when a KISSsoft report is generated.

Bolt calculation for high and low temperatures

Bolts are usually mounted at ambient temperature. However, the operating temperature has a significant influence on the tension state of the bolt and therefore also on the safety and security of the connection. For example, if steel bolts are inserted into light metal materials, the conditions change dramatically, even at an operating temperature of 70 degrees.

The bolt calculation function in KISSsoft has now been extended to permit bolted joints to be calculated at operating temperatures between -200 and +1000 degrees Celsius, applying the calculation guideline according to VDI 2230. Different temperatures can be specified for bolts and clamped parts.

The change in preload due to thermal expansion is calculated according to H. Wigand, Schraubenverbindungen, 4th Edition, 1988. All other calculations are based on the equations in VDI 2230.

If you are interested in acquiring a test license, please contact us at info@KISSsoft.AG