

This archive contains a modified version of the Z88Aurora solver Z88RS, which provides the ability to solve the linear equation system of linear mechanical FEM analyses using the graphics processing unit (GPU). The solver uses an iterative algorithm (conjugated gradient method without preconditioning).

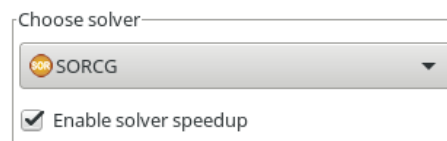
Tabelle 1: Content of the archive

file	description
z88rs.exe	Modified version of the solver
z88rs_std.exe	Standard version of the solver
cuda64_70.dll	CUDA-Runtime for 64-bit
readme_de.pdf	German version of the manual
readme_en.pdf	English version of the manual

The use of this solver requires an NVIDIA graphics card. All GPUs with a compute capability of 3.0 or higher are supported. The website [1] lists all GPUs from NVIDIA and the corresponding compute capability. Please note that currently only a 64bit version of Windows is supported.

To use this GPU accelerated solver, the files *z88rs.exe* and *cuda64_70.dll* in this archive have to be copied to the Z88Aurora installation directory, which is by default C:\Z88AuroraV3\win\bin. Please note that by doing this the normal Z88RS solver will be overwritten and afterwards no calculation on the CPU will be possible. Please backup the original files if necessary. The standard version of the solver *z88rs.exe* is also part of the archive (see *z88rs_std.exe*).

To use this solver in Z88Aurora, the solver *SORCG* has to be chosen in the solver menu and the checkbox *Enable solver speedup* has to be activated.



The possible return codes of the solver subroutine are listed in table 2. If an unexpected error occurs, we kindly ask for a brief feedback to improve the compatibility in future versions.

By default the GPU with the ID 0 will be used and the divergence control is disabled. To change this behavior you have to create a file named *z88cuda.txt* in the project folder.

The file has to contain one line with the format *device_ID divergence_factor*. To disable the divergence control the divergence factor has to be set to 0. Otherwise the current residual will be compared every iteration to the product of the initial residual and the divergence factor. The program execution will be terminated if the current residual is greater than this calculated value.

Table 2: return codes of the GPU solver

return code	description
1	reached the absolute tolerance criteria
2	reached the maximum number of iterations
3	reached the divergence criteria
4	common CUDA error occurred
5	submitted invalid parameters
6	no CUDA driver available
7	submitted invalid CUDA device
8	no CUDA device available
9	compute capability too low
10	cudaComputeModeProhibited set
11	memory allocation error on the CUDA device
12	memory deallocation error on the CUDA device
13	failed to copy data to the CUDA device
14	synchronization error

Please note that this is a test version of the GPU solver. In particular the results of small models or models with shell elements can be wrong. Please validate the results with another solver.

[1] <https://developer.nvidia.com/cuda-gpus>