

# Forum „MAGMAstress“

Let's talk about MAGMAstress  
„Sand casting“

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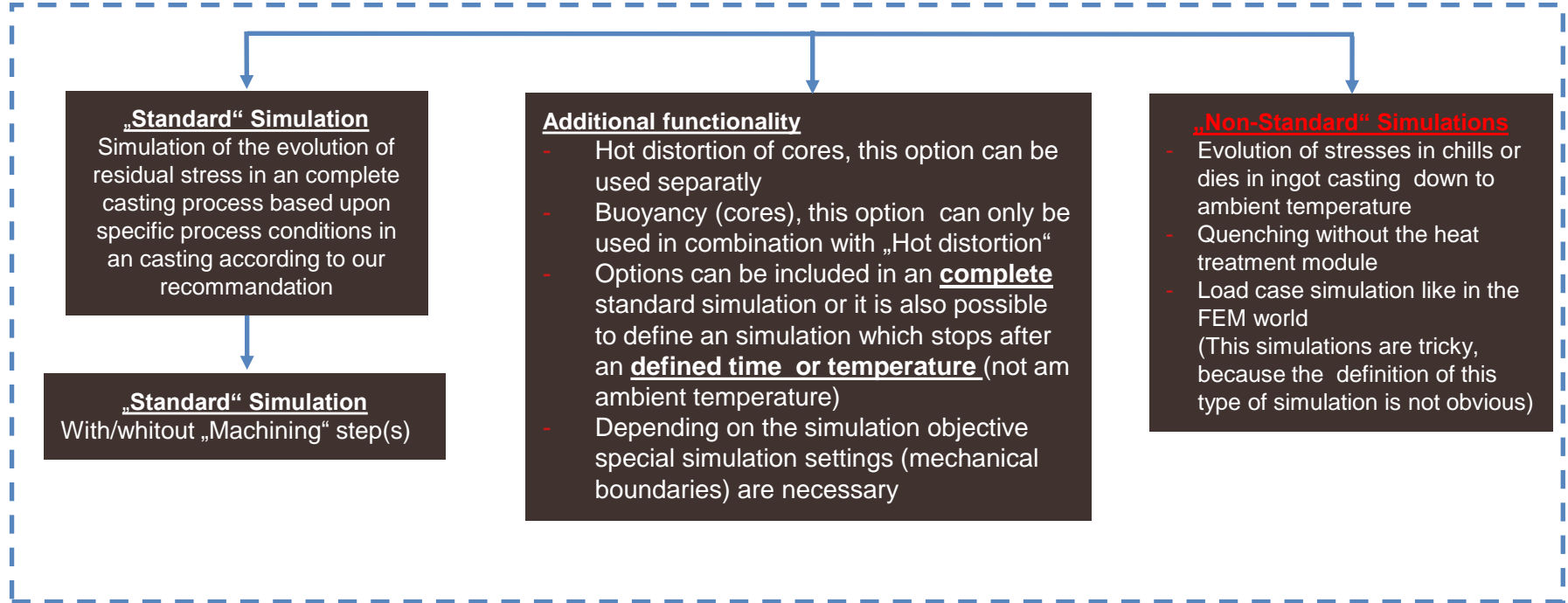
## International MAGMA User Meeting 2024

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# MAGMAstress

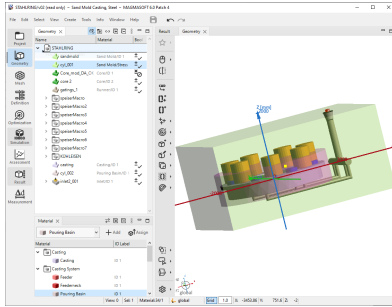
## Sand casting



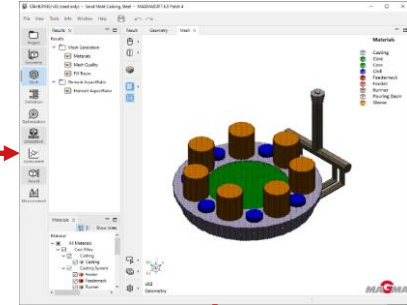
# The „Workflow“

## The „Perspectives“ – Your guide for the definition

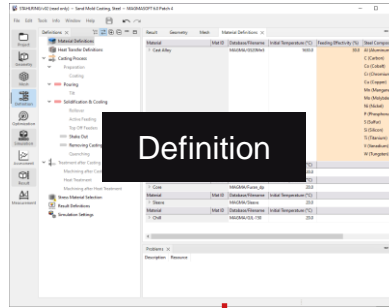
Geometry



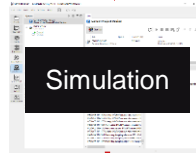
Mesh



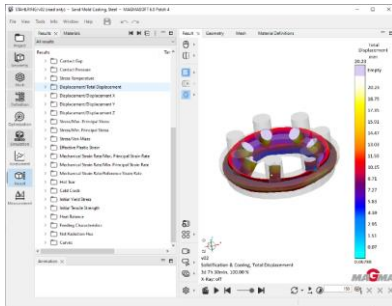
Definition



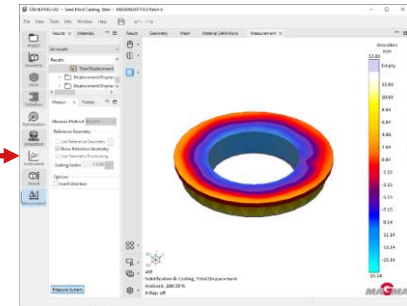
Simulation



Result

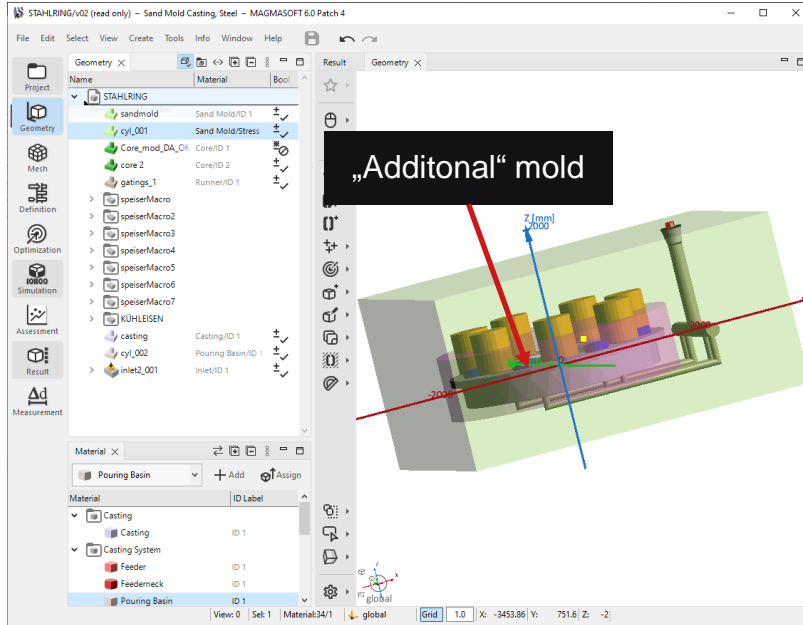


Measurement



# Geometry Perspective

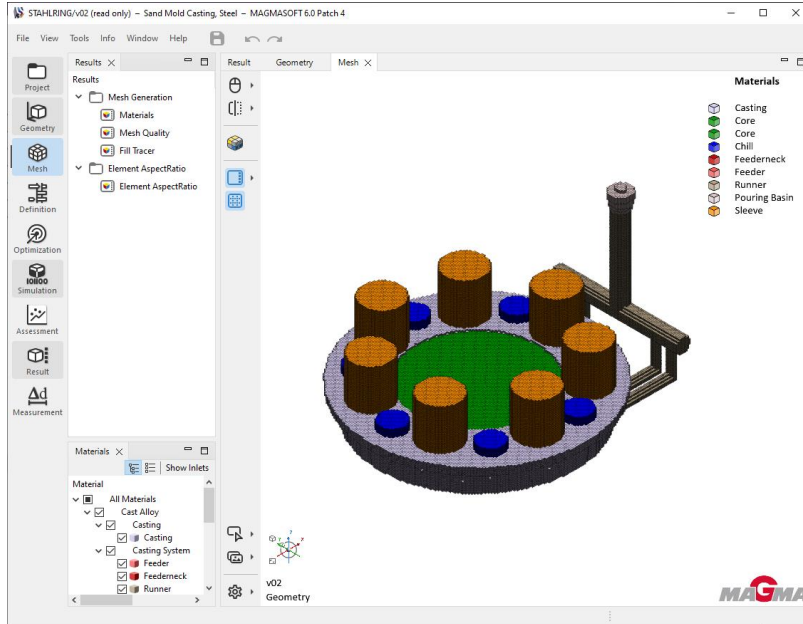
## Preparation – What is important to keep in mind



- From a principal point of view there is no need to prepare „something“ for a stress simulation
- But it is still recommended to **minimize** the calculation time
- The size of this additional mold depends on the other geometries
- It could also be a good idea to split geometries (for example the „Runner“) to minimize the other „Cast materials“ which constrain the casting during the process

# Mesh Perspective

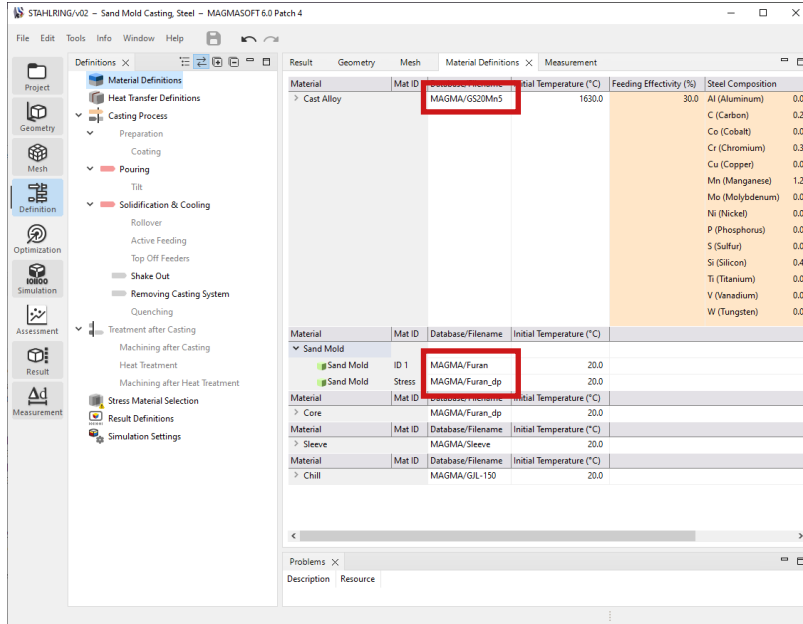
## The mesh



- We still need a good mesh
- A mesh is always a „**compromise**“
- In this case a „Cutbox“ could be easily used
  - A „Cutbox“ is also a good idea if a finer mesh is needed
  - A „Cutbox“ is also possible if the geometry is not symmetric!

# Definition Perspective

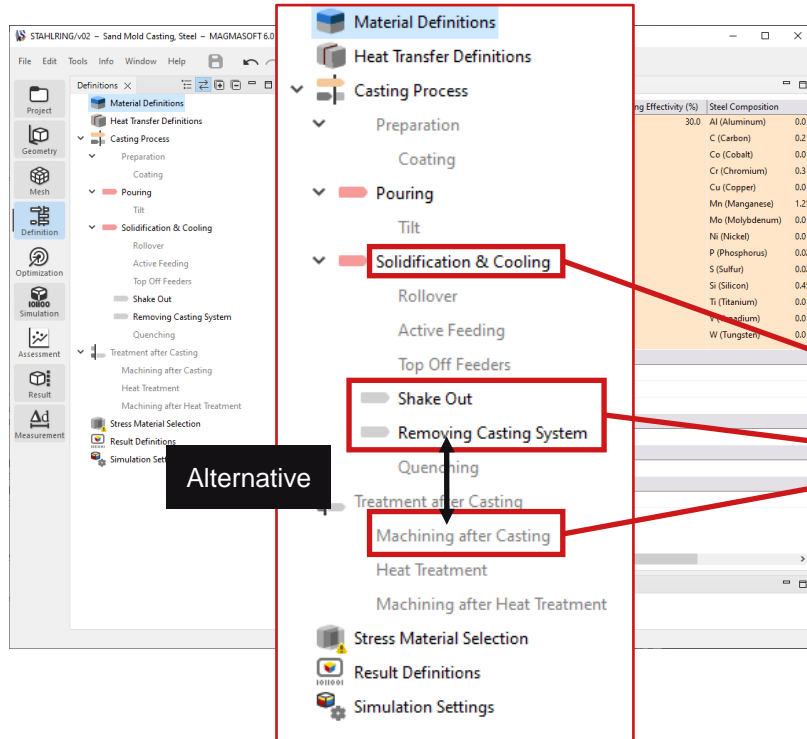
## Material data



- **Data sets** from MAGMADB are a good bases for a simulation
- Never the less updated data are always better, especially in case of core and mold data sets
- Maybe **measurements** of thermo-physical and thermo- mechanical data could improve the simulation accuracy
- An inverse optimization to determine better data could be the first step

# Definition Perspective

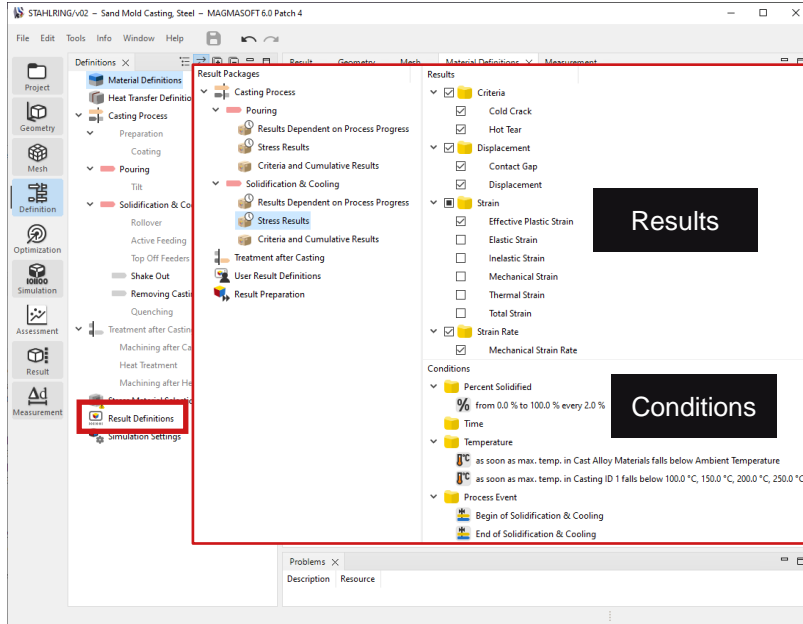
## Process parameters



- Knowledge about the process is mandatory
- We have to „squeeze“ the real process into the simulation, it means there is the real process and there a settings which have an effect on the simulation run
- „Stop“ criterion“
- Removal of the gating system, mold and core materials

# Definition Perspective

## Results

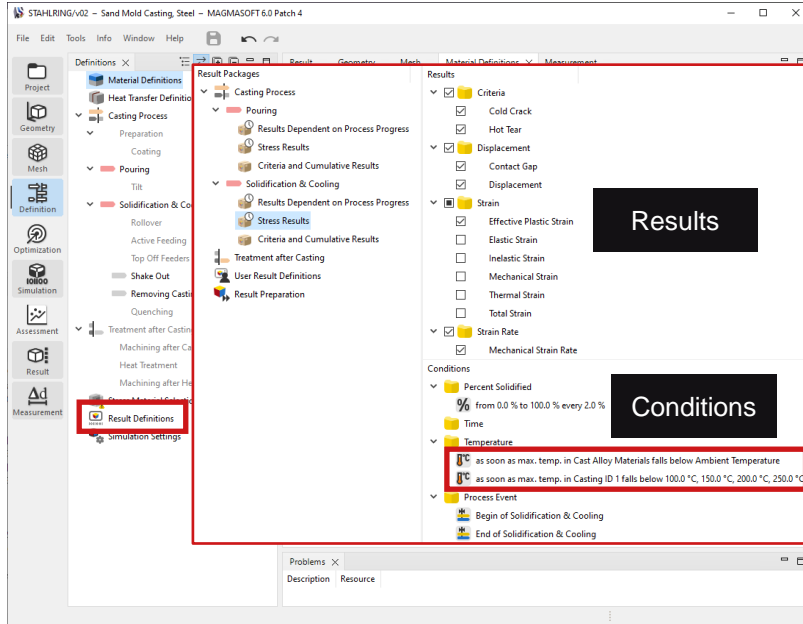


- All necessary results **predefined**
- In case of an hot tear only two additional results are necessary
- The three standard conditions are also predefined
- Sometimes it is useful to change or add the conditons, in this case results down to 100°C are ordered



# Definition Perspective

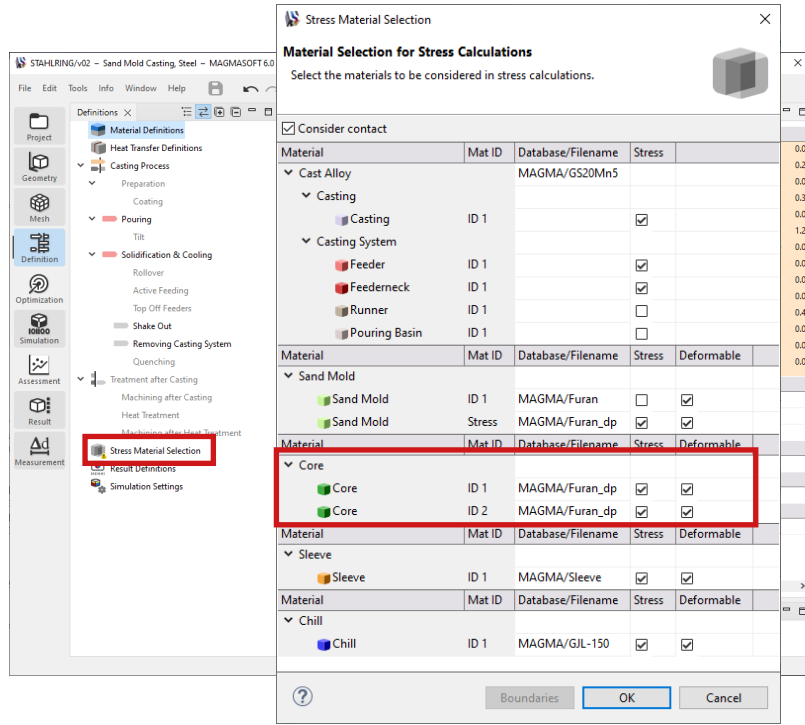
## Results



- The conditions have an impact on the simulation run, for example it could be an good idea to stop the stress simulation when a casting is solidified. In such a case just delete the two „Temperature“ conditions and the simulation stops at 100% of solidification.
- This could be useful in for an „Hot Tear“-Simulation or a simulation to get the core distortion

# Definition Perspective – other „Objectives“

## Core deformation – **Another objective**

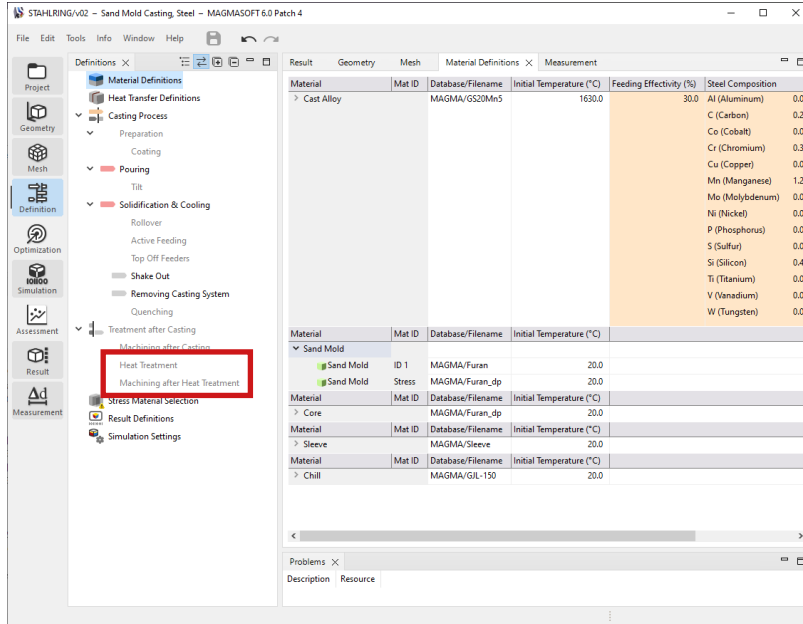


- A **separate simulation** to look at the deformation of a core could be useful
- Today this is another „Objective“
- A complete simulation which includes the core deformation is not useful due to technical limitations
- In this case it is not necessary to run the stress simulation down to room temperature!

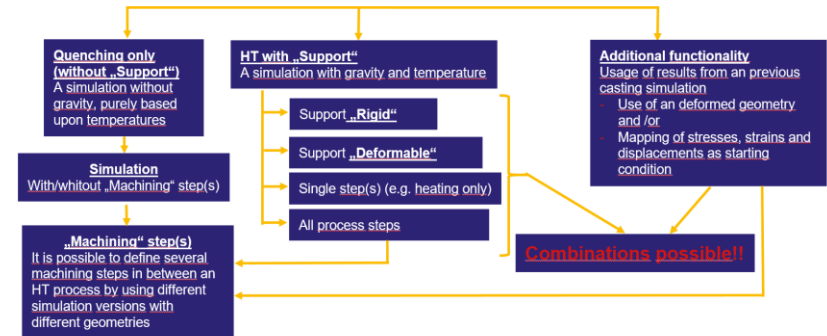
# Definition Perspective – other „Objectives“

## Heat treatment – its a **playground**

- Technically a „combined“, expected simulation (Casting + Heat treatment) is possible, but it is not in all cases really useful

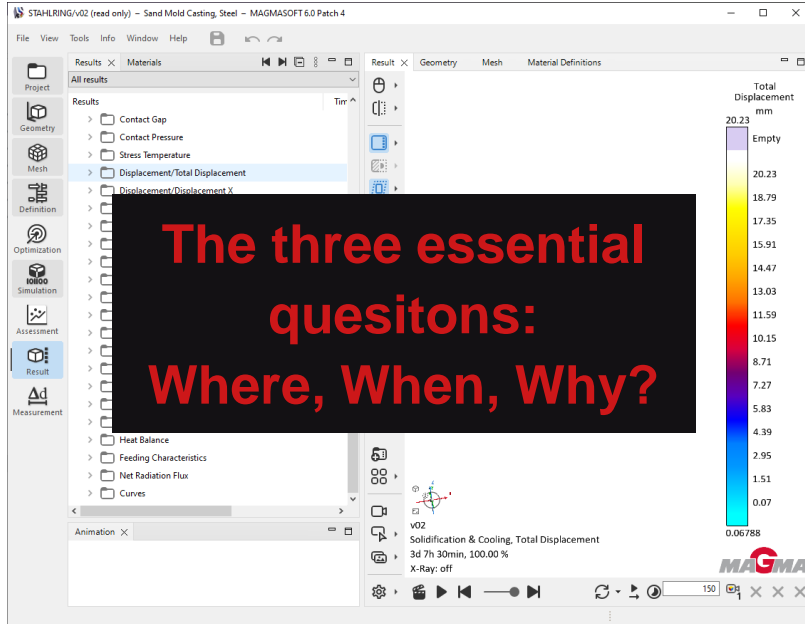


### Heat treatment – Independent, separate heat treatment simulation



# Result Perspective

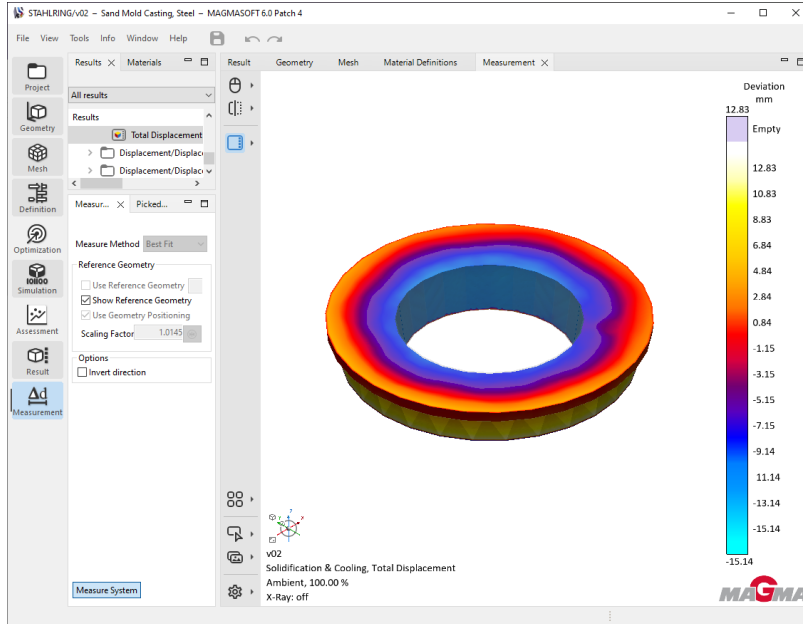
## Stress results – How to evaluate the results



- Check the simulation
- Look at the crack criteria at „Ambient temperature“ and maybe “Machining“
- Look at the crack criteria at „Shake Out“ and other events
- Pick points in critical areas to create curves (Stresses + material properties)
- Create animations
  - „Stress Temperature“
  - „Mises“
  - with „Distortion“

# Measurement Perspective

## Deformation of a casting



- The „Measurement Perspective“ offers a few functionalities to get an idea about the deformation of the casting
  - **3-Point Transformation**
  - **6-Point Transformation**
  - **Best-Fit**
- The next version contains three new additional functionalities:
  - “Distance” – Length
  - “Flatness” – Flatness of a surface
  - “Roundness”- roundness of a round area

# Thank you for your attention.

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