Difference between Absolute and Relative coordination in MBS
About joint

Absolute coordination is relative for simulation coordination system, mainly for coordination system of the main assembly. In the picture below, the main coordination system is in the right side of the bottom part (ID 00474/B1 in teamcenter).
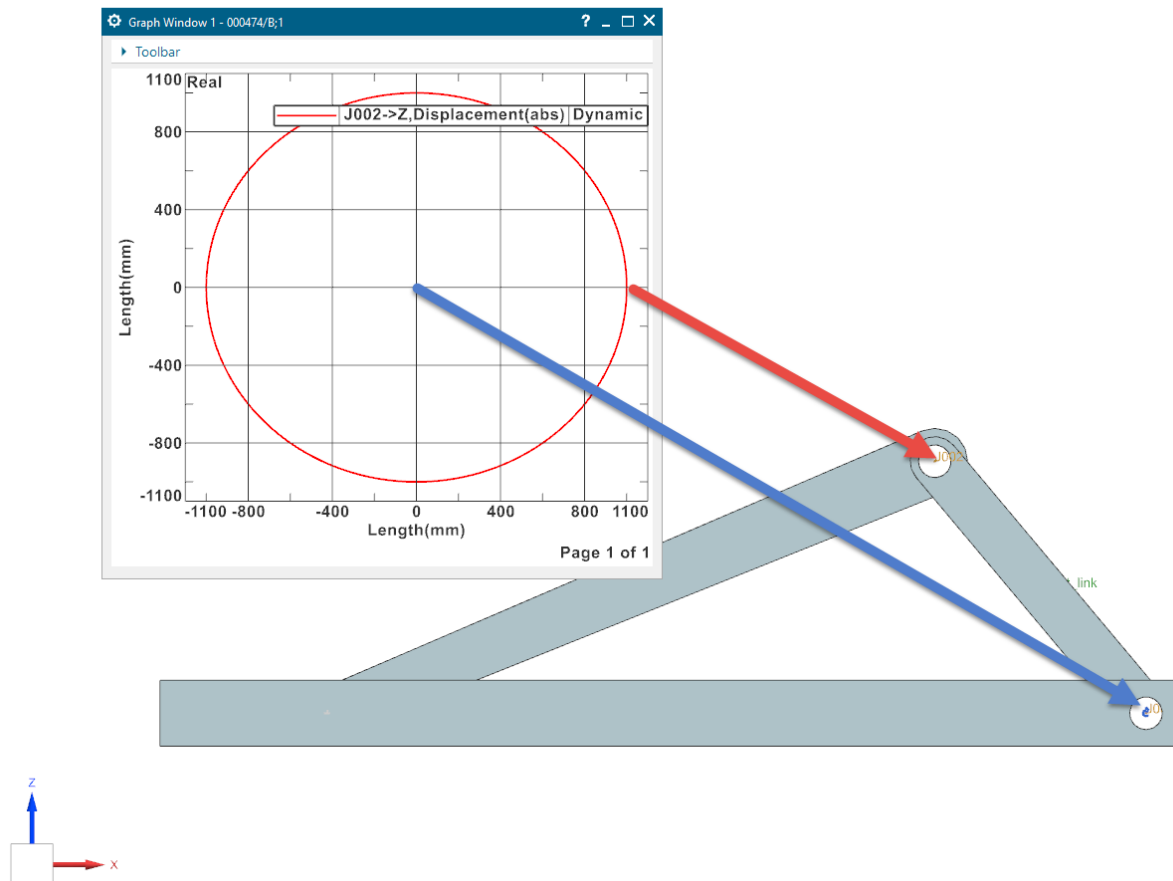

*Figure 1: **Absolute** displacement graph of J002 (red arrow shows location).*

Relative coordination system is relative to coordination system of the **joint** and it is attached to a body. In the picture below, J002 relative coordination system is attached to longer link part. The orientation of coordination system in the picture case is X-axis downwards and Y-axis left, and aligned with main coordination systems.
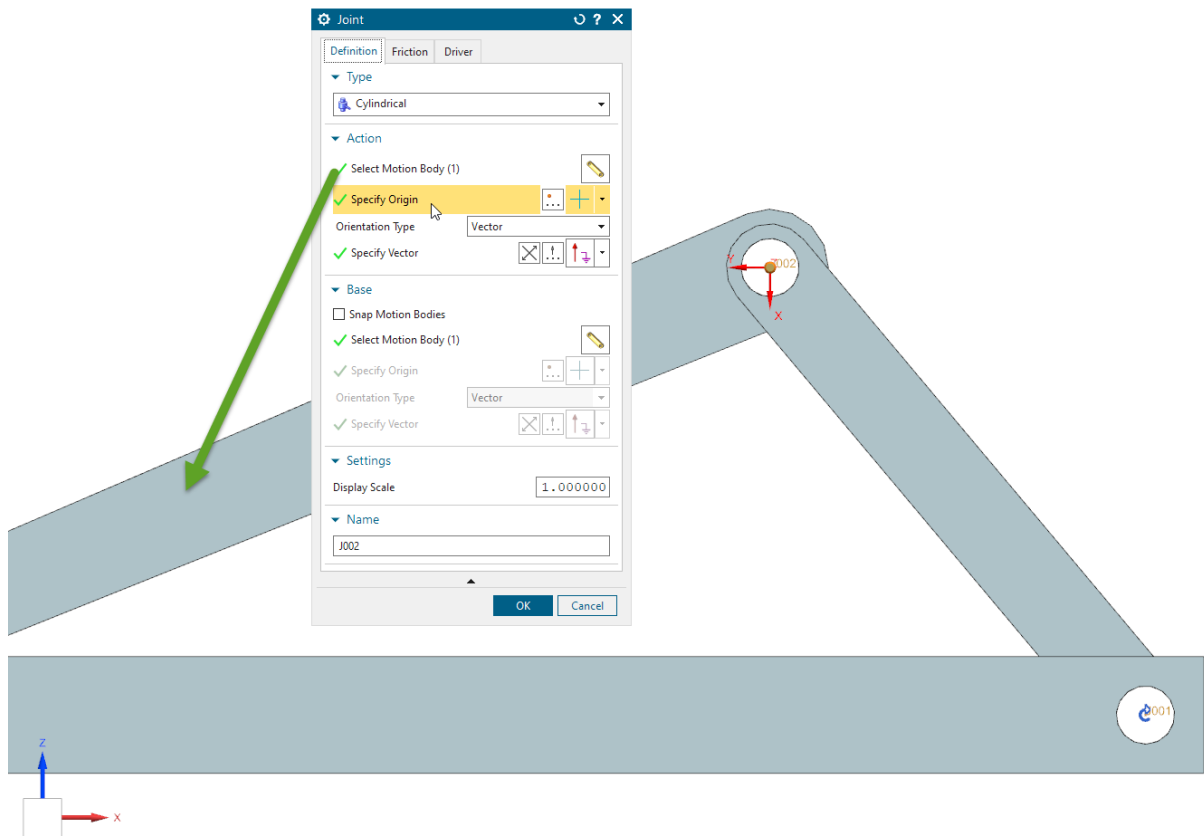
Figure 2: Joint. Action Motion Body is shown in green arrow. Notice the red coordination axes in the joint location.

As you can notice from the next picture, the relative coordination system stays on place (some calculation errors are visible, but values are close to zero):
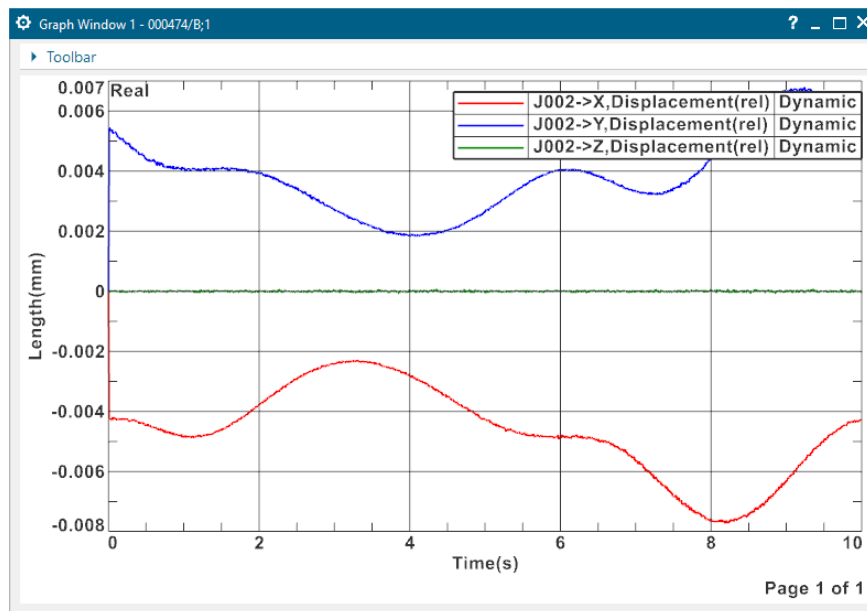

*Figure 3: Displacement graphs (all three axis) or **Relative** joint. Notice that the joint stays in place.*

Changing Joint orientation

Sometimes it is beneficial to reattach joint to fully utilize body's (part's) own coordination system. This can help when creating forces in FEM. First, **Replace Reference Set** of Action body (part) to **Entire Model** (Application → Modeling → Select part from Assembly Navigator → RMB → Replace Reference Set → Entire Model). Then go back to **Motion** mode, modify joint (in this case J002), change *Orientation Type* to **CSYS**, change selection type to *Z-Axis, X-Axis, Origin*. Pick the three elements as seen in Figure 4. Notice, that body here included the skeleton geometries (line and axis).
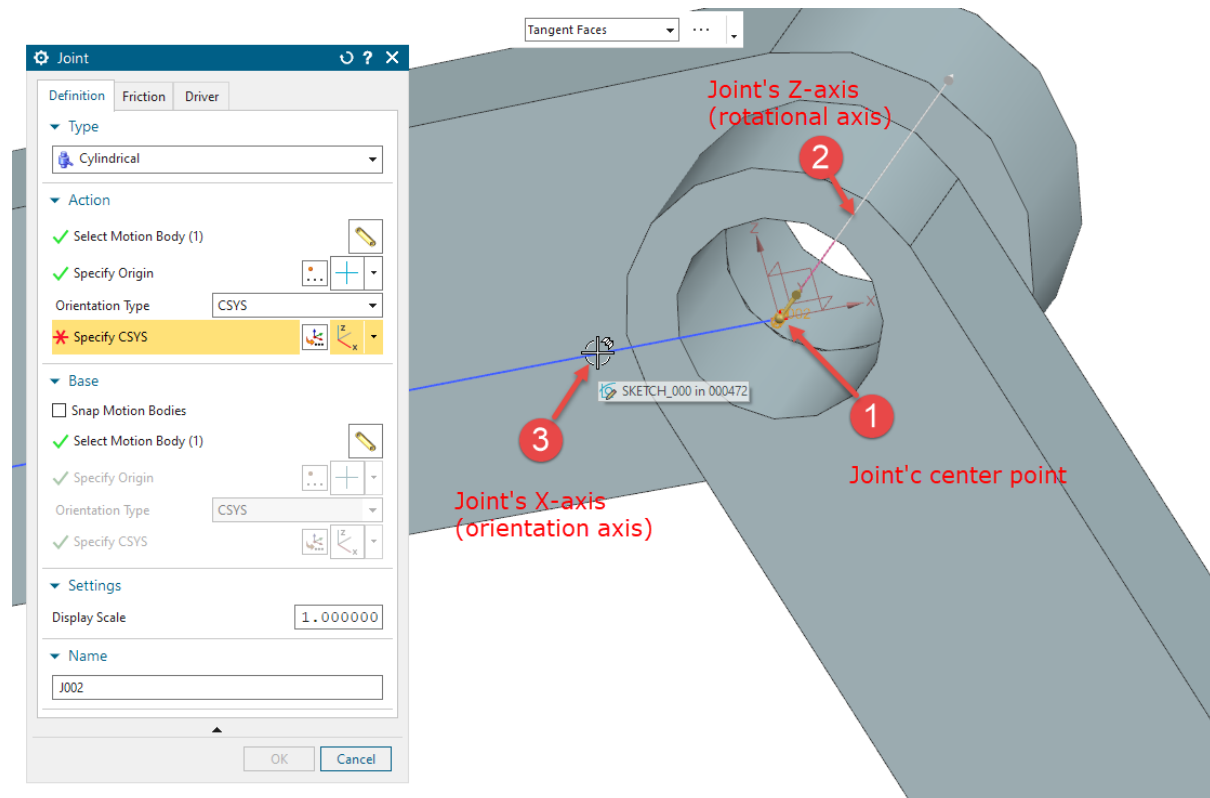

Figure 4: Joint modified, Orientation Type is changed to CSYS and part's coordination system is selected as orientation.

Ready joint's orientation should be like in the next picture (X points up.
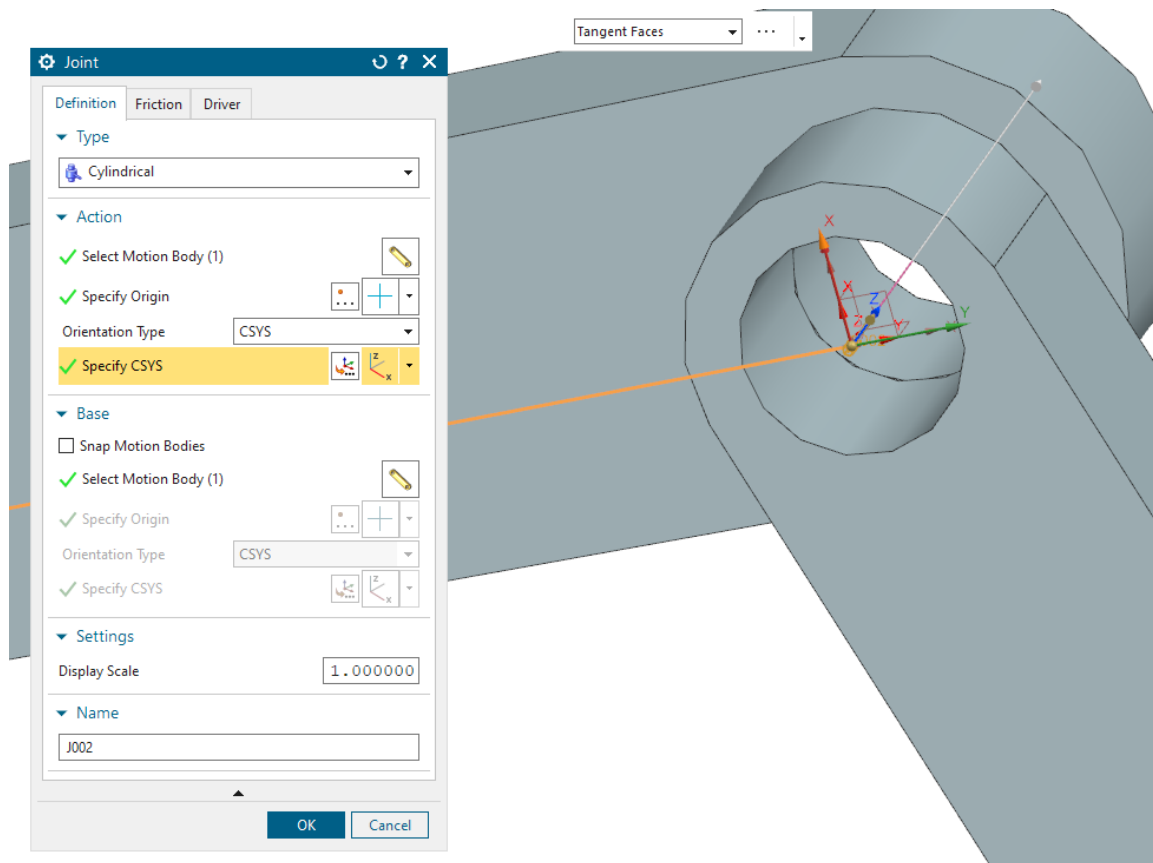
Figure 5: Modified joint. Notice, that X axis points upwards.

Absolute forces of in direction of X and Z, as well as Relative forces for direction X and Y are plotted in the next picture. Notice, that this model has 10000N load along X-axis, that is very visible in Absolute Force X-direction results, but less visible in Relative forces (since coordination moves along the moving body). Also, Relative X points upwards.
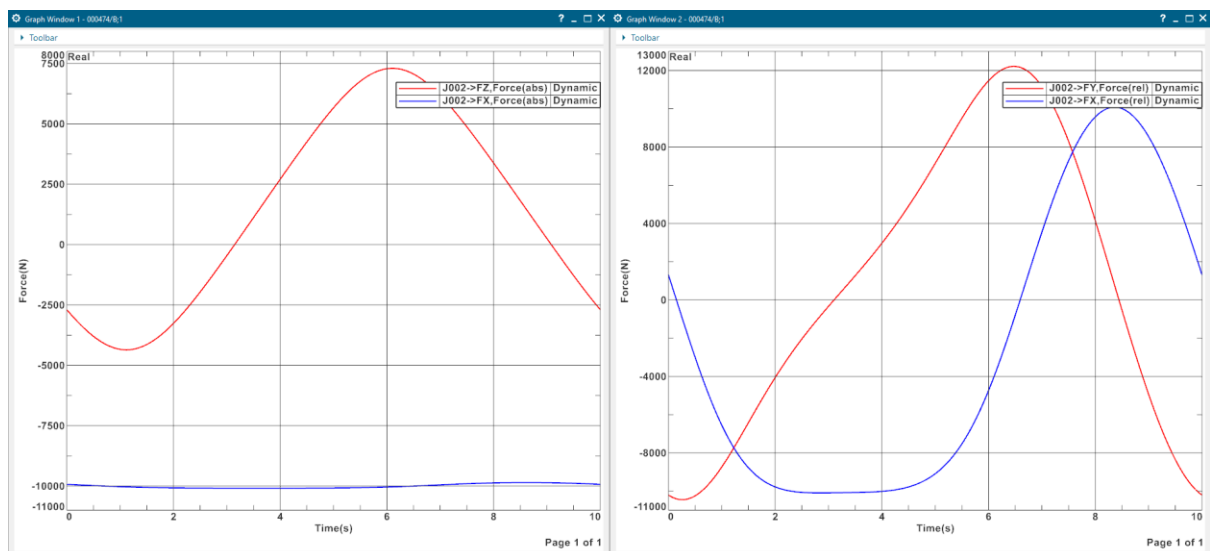

Figure 6: Absolute (left) and Relative (right) force plots.