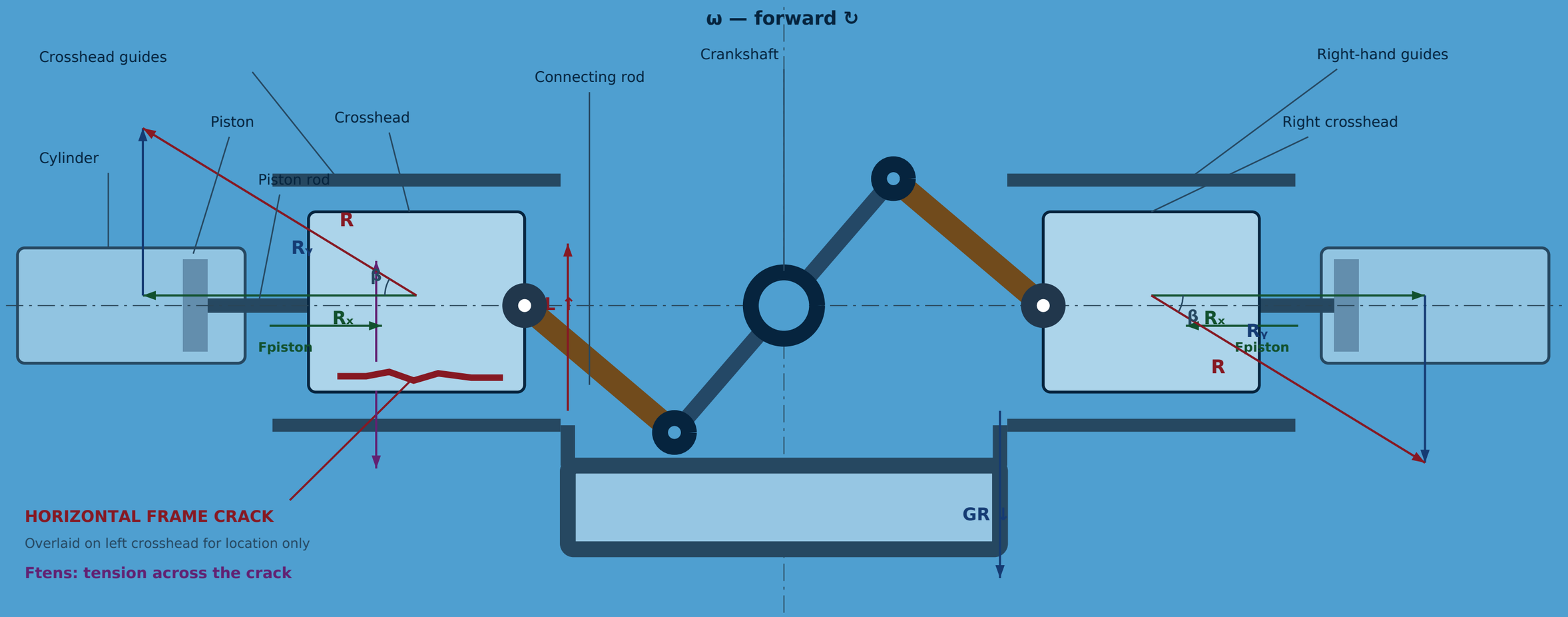
Opposed Borsig compressor: crosshead force and frame crack

Diagram 1 — forward rotation: opening load across the crack

Red shows connecting-rod reaction R at the crosshead; green and blue show its horizontal and vertical components. G is the force from the crosshead on the frame guide.



Force components are drawn on each crosshead

R is the rod reaction on the crosshead under piston and inertia loads; R_x acts along the cylinder axis, R_y across it, and β is the rod angle. Schematic decomposition: $|R_y| = |R_x| \cdot |\tan \beta|$. G (load on the frame) points with R_y; the guide reaction on the crosshead points opposite.

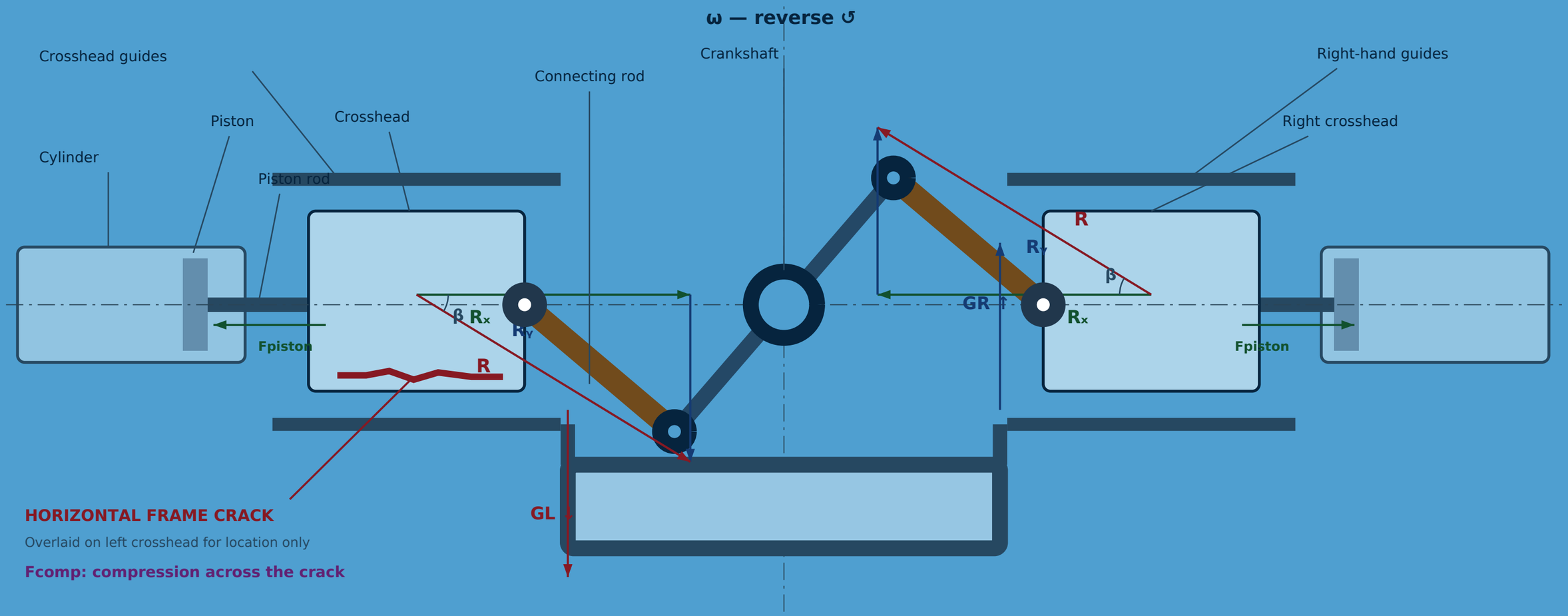
In the stated forward working stroke, the horizontal crack experiences an opening load. Stress magnitudes are not specified in this diagram.

Location note: the crack is drawn over the crosshead to locate it between the guides; the damaged part is the frame. Load reversal refers to the described operating condition, not solely to changing the sign of angular velocity.

Opposed Borsig compressor: crosshead force and frame crack

Diagram 2 — reverse rotation: compression across the crack

Red shows connecting-rod reaction R at the crosshead; green and blue show its horizontal and vertical components. G is the force from the crosshead on the frame guide.



Force components are drawn on each crosshead

R is the rod reaction on the crosshead under piston and inertia loads; R_x acts along the cylinder axis, R_y across it, and β is the rod angle. Schematic decomposition: $|R_y| = |R_x| \cdot |\tan \beta|$. G (load on the frame) points with R_y; the guide reaction on the crosshead points opposite.

In the stated reverse working stroke, the axial load changes sign: R_y and G reverse on each side. The crack zone is compressed instead of stretched. Strain-gauge measurements verify the actual stress state.

Location note: the crack is drawn over the crosshead to locate it between the guides; the damaged part is the frame. Load reversal refers to the described operating condition, not solely to changing the sign of angular velocity.