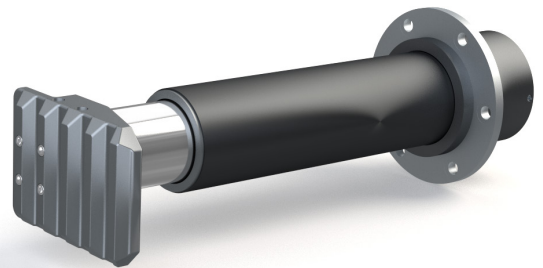


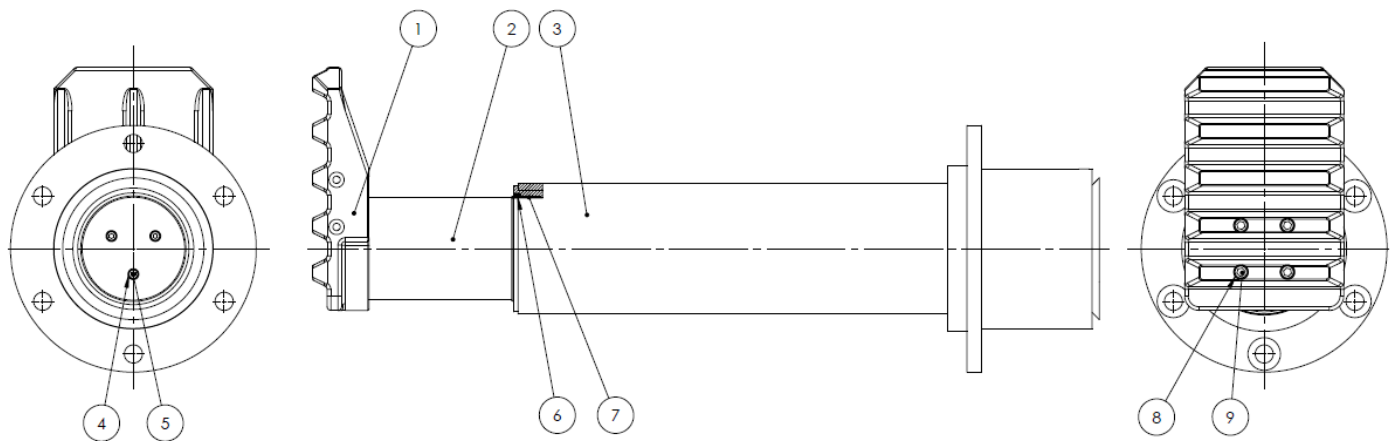


The crash buffer consists of a regenerative gas hydraulic buffer in series with a deformation tube. The stroke length for the gas hydraulic buffer and the stroke length for the deformation tube, resulting in a total stroke. The anticlimber front plate is shaped as a “foot” to meet the offset requirement with a crash against a freight wagon.

The force levels and the resultant energy absorption have been designed in order to meet the requirements of EN15227:2008 for crashworthiness.



**FIGURE 1 GENERAL VIEW OF SIDEBUFFER**



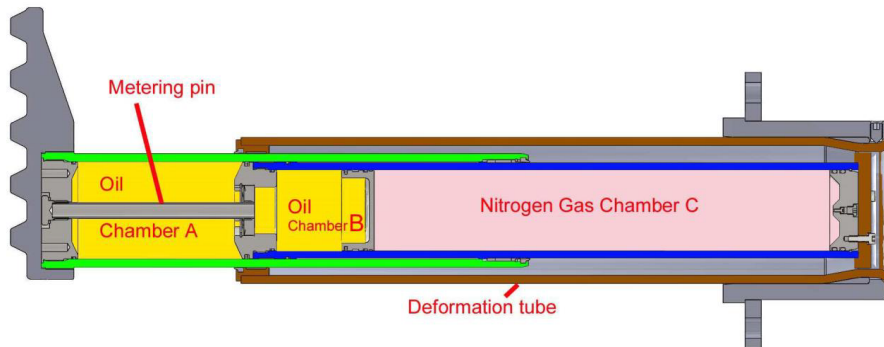
### FORCE CHARACTERISTIC

The reaction force is primarily generated by viscous losses when oil is being forced through a calibrated flow restriction. The force characteristic of the gas hydraulic damper is velocity and displacement dependent.

At higher impact velocities, the reaction force exceeds the

release force of the tube and starts the deformation. The force is achieved by plastic deformation when the tube diameter is sized down to a smaller diameter, resulting in a constant force. The grade of deformation is calibrated to achieve the correct reaction force.

**FIGURE 2 CUT VIEW OF SIDEBUFFER GHE120**

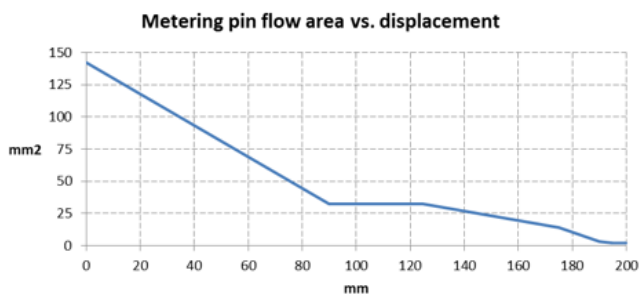


During impact, when the oil is passing from chamber A to chamber B (see figure 2) it has to pass the flow restriction of the metering pin. The flow area, given by the metering pin, is

continuously changing over the stroke. The flow area of the first part is optimized to match the requirement of a crash with a regional train.

**FIGURE 3 METERING PIN FLOW AREA VS DISPLACEMENT (EXAMPLE)**

**FIGURE 4 FORCE VS STROKE DIAGRAMS (EXAMPLE)**

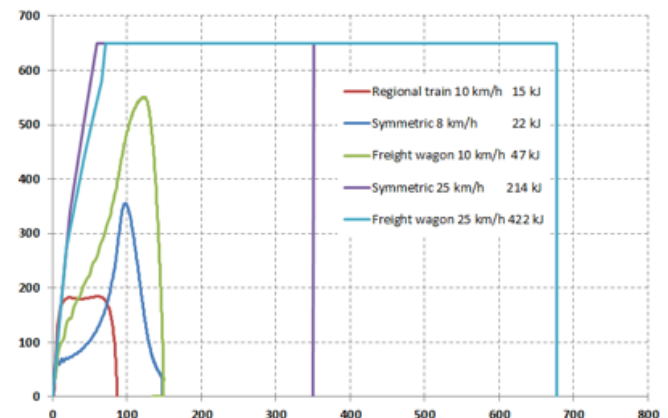


The generated force is proportional to the square of the dampers relative velocity.

Note that since the crash buffer acts in series with the car frame rigidity and rigidity of the obstacle, the dampers relative speed may differ from the vehicle speed.

### GENERAL SPECIFICATION

- Force from 500 – 1200 kN
- Stroke 100 - 900 mm
- Vertikal load 100 kN
- Operating down to -50° C



The interaction between the different elements in each crash scenario results in the different Force vs Stroke characteristics.

Figure 4 shows the graph from the different crash scenarios.