

Simplified Retractor Model Public Far-Side Loadcase


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200603


The retractor model is a generic functional model of a retractor comprising the most important functions


Identical models in LS-DYNA and PAM-CRASH


Unit system: mm, kN, ms, kg


 Simplified_retractor_model_LS-DYNA_with_RP_v002.inc

 Simplified_retractor_model_LS-DYNA_with_RP_v002.key

 Simplified_retractor_model_LS-DYNA_without_RP_v002.inc

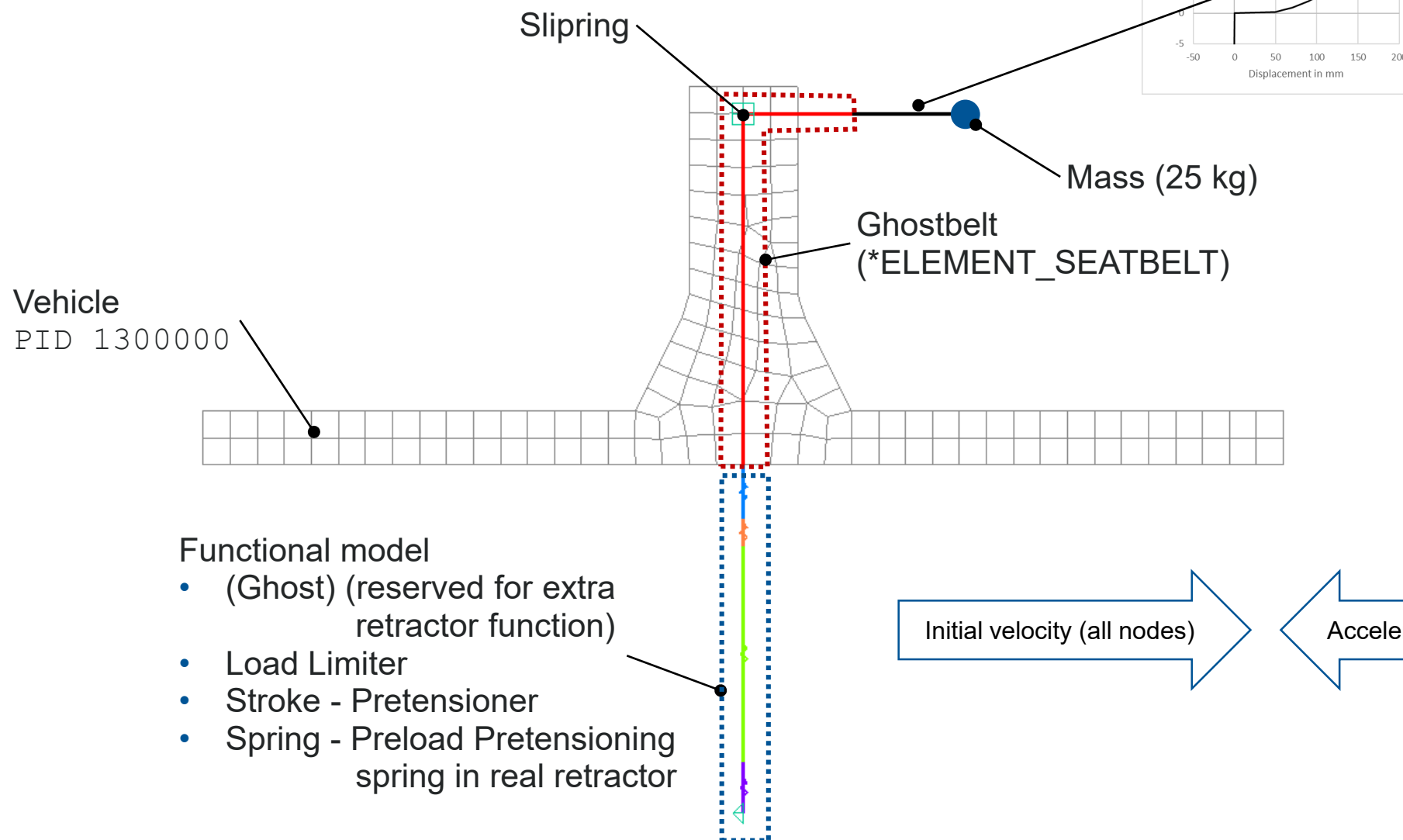
 Simplified_retractor_model_LS-DYNA_without_RP_v002.key

 Simplified_retractor_model_PAM-Crash_with_RP.inc

 Simplified_retractor_model_PAM-Crash_without_RP.inc

Model explanation

Functional retractor model approach



Functional retractor model description

■ Beam element – Pre-Load

- Low amount of preload defined for the spring element to generate some pay-in prior to the retractor locking or TTF. The amount of preload can be adjusted by parameter SR1SPR.
- In tension, pay-out can be generated prior to locking of the retractor (or TTF). At t=0 element is released (default)
- The element gets locked, if the retractor locking time is reached (SR1RLO) in non-pretensioning load cases
or
if the pretensioner is released (SR1RPd) in pretensioning load cases

■ Beam element - Stroke element - Pretensioner

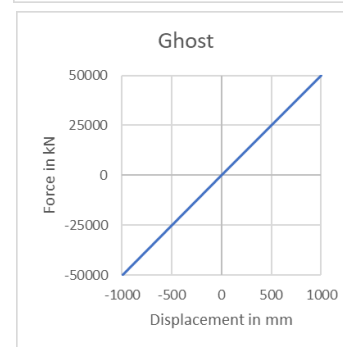
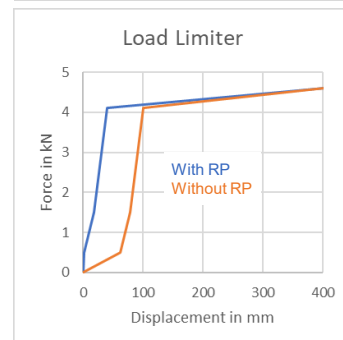
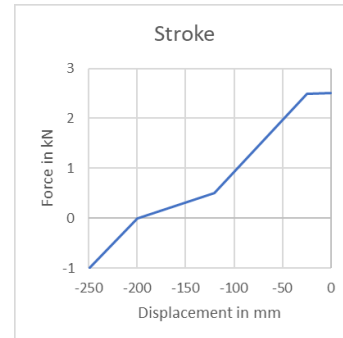
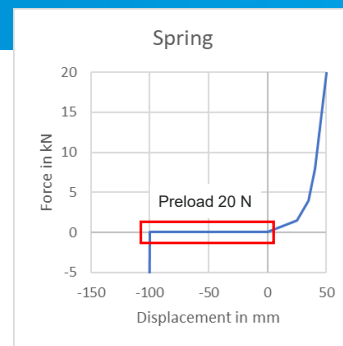
- Pretensioner modelled as preloaded spring which generates pay-in once it is released (SR1TTF & SR1RPd (2-3ms)).
- Y-Axis values (Force) can be scaled by parameter SR1POW, to modify the force of the pretensioner
- Time to fire (TTF) is defined by the parameter SR1TTF. The stroke element is first released after a short delay (defined with SR1RPd (2-3ms))
- The duration of the pretensioning phase is defined by the parameter SR1PdT (Time). If it's time is reached, the pretensioning ends and the stroke element gets locked

■ Beam element - Load limiter

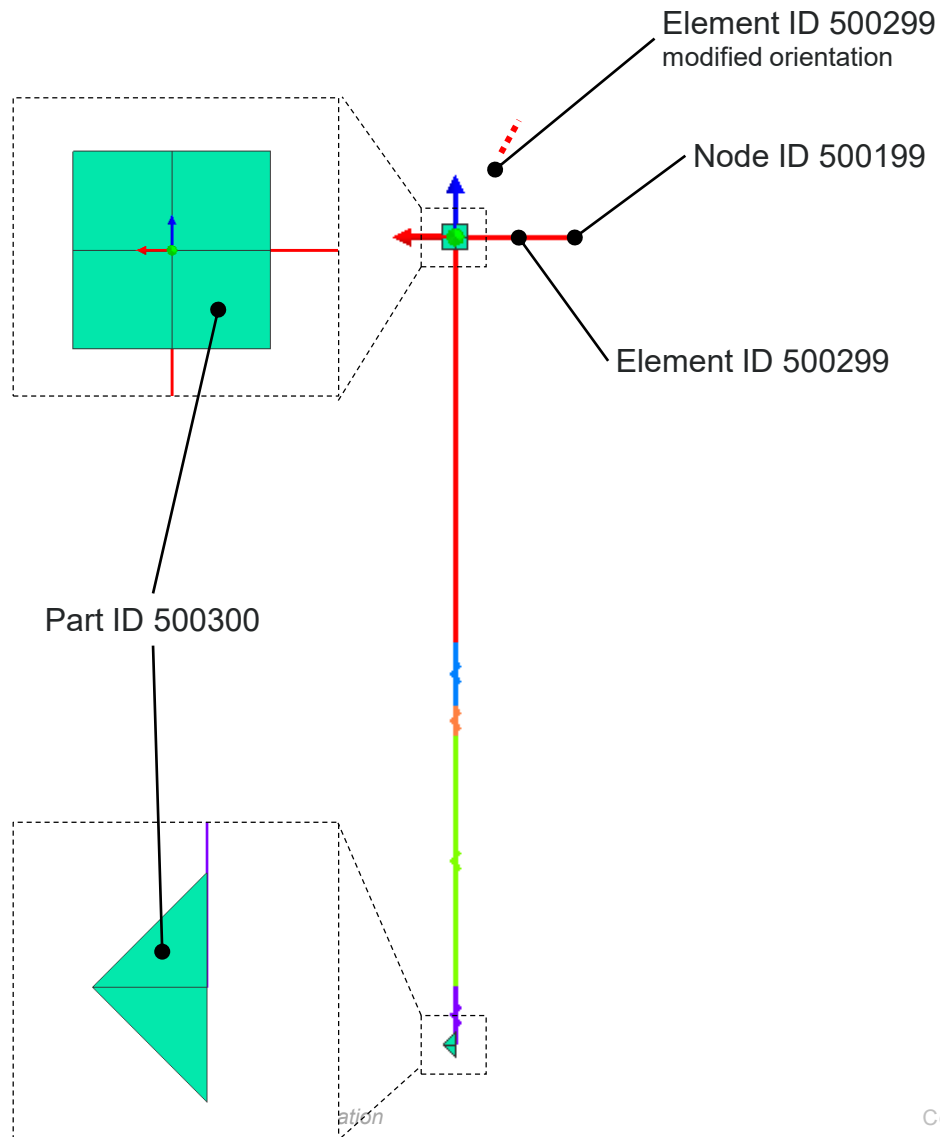
- The stiffness characteristics defines the resistance in the load limiting phase
- This element is released if the retractor gets locked by SR1RLO in non-pretensioning load cases
or
if the stroke gets locked by parameter SR1PdT in pretensioning cases
- Depending on the pretensioning case (with or without RP), different curves are used for the load limiter element
- The load limiting level can be adjusted by parameter SR1LL1 (Force).
- The slope during the load limiting phase can be adjusted by parameter SR1LL2 (Force).

■ Beam element Ghost element – Element reserved for later modifications

- This element is defined with a very stiff characteristic for tension and compression area, so that this element does not affect the behavior of the retractor model.
- It can be considered as a reserve element for the case, that an additional element is required in a later stage of this project



Functional retractor model connection



Connection Functional model – Webbing

Please use node 500199 to connect the webbing to the functional model.

The orientation of element 500299 can be adapted to the respective needs. Please make sure, that this element will not become too short. The pretensioner should not be able to pull in the complete length of this element

Connection Functional model – Environment (e.g. sled)

The attachment of the functional model to the environment (e.g. sled), can be realized by using following cards (which are already available in the input deck):

LS-Dyna:

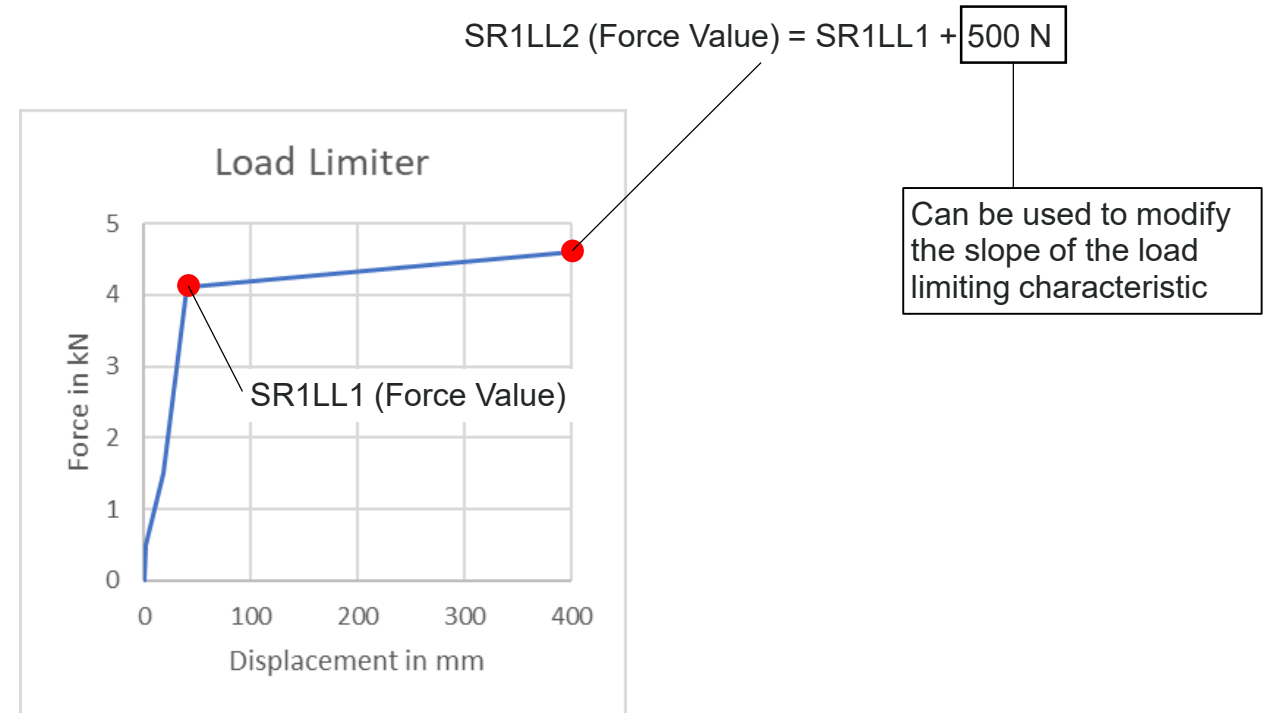
```
*CONSTRAINED_RIGID_BODIES
$      PIDM      PIDS
      1300000      500300
```

PAM-Crash:

```
TIED / 500295 500395
NAME Attachment
      PART      500300
      END
      PART      1300000
      END
```

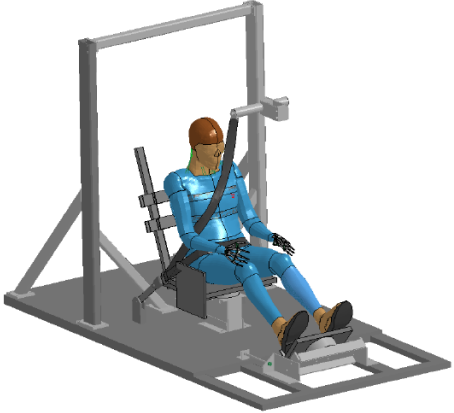
Functional retractor model tuning parameters

- Pretensioning activation time
 - SR1TTF
- Pretensioner force
 - SR1POW
- Pretensioner duration
 - SR1PdT
- Load limiting force
 - SR1LL1
 - SR1LL2
- Switch time between pretensioning and load limiting
 - SR1PdT (same parameter as pretensioner duration. This parameter ends the pretensioning phase and releases the load limiting phase)



THUMS User Community (TUC)

Generic Retractor Model Used in Far-Side Loadcase



MS Users Community 2

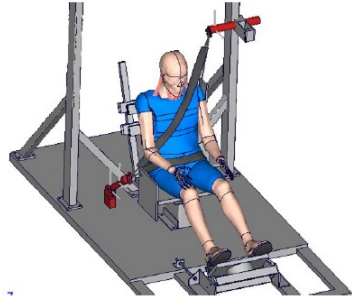
THUMS 2019.01
status Far Side Occupant Loadcase -

essmann, DYNAmore GmbH, 2019

Stuttgart, November 2019

Data classification Slide 1 of X

DYNA
MORE



THUMS user community 2
VPS status farside occupant load case
TUC THUMS v2019.01

Jürgen Jaenecke, Simon Dussinger – Engineering System International GmbH
2020-03-18

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Loadcasae will be presented at Euro NCAP meeting in June by BAST

<https://tuc-project.org/>

Loadcase based on Pipkorn et al. "Occupant Protection in Far-Side Impacts", IRCOBI 2018

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Internal

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