

Majority of impact energy absorbed
 Almost no recoil energy
 Standard range
 Cost effective solution
 Shorter project lead times



Up to 1500 kN force

Sentry

The rail industry is focused on improving passenger protection by introducing demanding crash worthiness standards such as EN15227 and ASME-RT-1.

Operators need to manage tight project budgets and reduce life cycle costs.

Oleo has developed the Sentry™ range of standard products that enable lower project costs per train coupling system by reducing the variety and complexity.

The Sentry™ range also offers higher coupling speeds, significant weight savings and reduced life cycle costs.

Product Details

- Recoverable and non-recoverable crash protection in one standard modular unit.
- Gas hydraulic buffer
- Deformation tube
- Fully customisable force/stroke characteristics at no extra cost.
- Integral anti-rotation system.
- All units tested by Oleo with validated mathematical models in accordance with EN15227. Plug in elements available for Radioss and LS-Dyna finite element software.
- The system used by OLEO for the mathematical modelling of crash scenarios is approved by a European Rail Authority as being accurate, appropriate and properly controlled.

Product Advantages

- Oleo's Sentry™ Device enables:
- Performance can be fully optimised with Oleo 1D Train™ at no additional cost.
 - Lower Life Cycle Costs
 - Weight Saving
 - Faster Coupling Speeds
 - Reduced Potential Impact Damage
 - Increased Passenger Protection
 - Pre-loads ranging from 50kN to 450kN
 - Higher recoverable energy absorption than any alternative solution.
 - Maintenance free between major train overhaul periods.



Applications



Metro



Light Rail



Locomotive & Freight



High Speed



Mainline



Sentry™ Coupler 1500 Clamp to Clamp Energy Absorber Specification

Low Spec		Description	Unit Code	Recoverable Coupling Speed Km/h				Coupler Deformation Speed Km/h				Maximum Collision Speed Km/h					
				AW0	AW1	AW2	AW3	AW0	AW1	AW2	AW3	AW0	AW1	AW2	AW3		
Number of Vehicles	1	Sentry™ Coupler – Front	M316														
Empty Vehicle Weight (AW0)	33T			8.5	8.5	8.5	8.3	17.8	17.0	16.3	16.0	-	-	-	-		
Passenger Weight (AW3)	16T																
Vehicle Strength	400kN																
Number of Vehicles	4	Sentry™ Coupler – Front Sentry™ Coupler – Intermediate Oleo Anti Climber – Front Oleo Anti Climber – Intermediate	M316 M323 AB90-80 AL10-50	8.0	7.8	7.5	7.5	14.8	14.0	13.3	12.8	28.3	27.0	25.8	25.0		
Empty Vehicle Weight (AW0)	36T																
Passenger Weight (AW3)	18T																
Vehicle Strength	800kN																
Number of Vehicles	5	Sentry™ Coupler – Front Sentry™ Coupler – Intermediate Oleo Anti Climber – Front	M523 M416 AF70-80	10.3	10.3	10.0	10.0	18.3	17.0	17.0	16.8	28.7	27.5	26.3	25.0		
Empty Vehicle Weight (AW0)	24T																
Passenger Weight (AW3)	12T																
Vehicle Strength	800kN																
Number of Vehicles	6	Sentry™ Coupler – Front Sentry™ Coupler – Intermediate Oleo Anti Climber – Front Oleo Anti Climber – Intermediate	M300 M300 AB70-100 AF50-90	7.5	7.3	7.0	7.0	-	-	-	-	28.5	27.3	26.3	25.0		
Empty Vehicle Weight (AW0)	47T																
Passenger Weight (AW3)	24T																
Vehicle Strength	800kN																
Number of Vehicles	6	Sentry™ Coupler – Front Sentry™ Coupler – Intermediate Oleo Anti Climber – Front Oleo Anti Climber – Intermediate	M416 M423 AB70-80 AL10-60	11.0	10.8	10.5	10.5	18.5	17.5	16.3	16.3	27.5	26.3	25.3	25.0		
Empty Vehicle Weight (AW0)	24T																
Passenger Weight (AW3)	12T																
Vehicle Strength	800kN																
Number of Vehicles	8	Sentry™ Coupler – Front Sentry™ Coupler – Intermediate Oleo Anti Climber – Front Oleo Anti Climber – Intermediate	M516 M523 AF70-80 AL20-60	12.8	12.5	12.3	12.0	19.3	17.8	17.8	17.5	28.0	27.0	26.0	25.0		
Empty Vehicle Weight (AW0)	24T																
Passenger Weight (AW3)	12T																
Vehicle Strength	800kN																

High Spec		Description	Unit Code	Recoverable Coupling Speed Km/h				Coupler Deformation Speed Km/h				Maximum Collision Speed Km/h			
				AW0	AW1	AW2	AW3	AW0	AW1	AW2	AW3	AW0	AW1	AW2	AW3
Number of Vehicles	5	Sentry™ Coupler – Front Sentry™ Coupler – Intermediate Oleo Anti Climber – Front	M323 M316 AF100-120	9.8	9.5	9.3	9.3	18.3	17.5	16.3	16.0	27.8	26.5	25.5	25.0
Empty Vehicle Weight (AW0)	40T														
Passenger Weight (AW3)	20T														
Vehicle Strength	2000kN														
Number of Vehicles	5	Sentry™ Coupler – Front Sentry™ Coupler – Intermediate Oleo Anti Climber – Front	M516 M400 AF70-120	12.0	11.8	11.5	11.5	18.8	17.8	17.0	16.8	28.0	26.8	25.8	25.0
Empty Vehicle Weight (AW0)	32T														
Passenger Weight (AW3)	16T														
Vehicle Strength	2000kN														
Number of Vehicles	6	Sentry™ Coupler – Front Sentry™ Coupler – Intermediate Oleo Anti Climber – Front	M400 M400 AF70-120	16.5	16.0	15.5	15.0	-	-	-	-	28.8	27.5	26.3	25.0
Empty Vehicle Weight (AW0)	24T														
Passenger Weight (AW3)	12T														
Vehicle Strength	2000kN														
Number of Vehicles	6	Sentry™ Coupler – Front Sentry™ Coupler – Intermediate Oleo Anti Climber – Front	M500 M500 AF80-120	16.0	15.8	15.5	15.3	-	-	-	-	27.5	26.3	25.0	25.0
Empty Vehicle Weight (AW0)	28T														
Passenger Weight (AW3)	14T														
Vehicle Strength	2000kN														
Number of Vehicles	6	Sentry™ Coupler – Front Sentry™ Coupler – Intermediate Oleo Anti Climber – Front	M416 M423 AF40-120	14.0	13.8	13.5	13.5	20.5	19.8	18.8	18.5	27.5	26.5	25.5	25.0
Empty Vehicle Weight (AW0)	28T														
Passenger Weight (AW3)	14T														
Vehicle Strength	1500kN														
Number of Vehicles	8	Sentry™ Coupler – Front Sentry™ Coupler – Intermediate Oleo Anti Climber – Front Oleo Anti Climber – Intermediate	M323 M323 AF40-140 AF30-120	11.0	10.8	10.3	9.3	17.8	16.5	16.0	16.0	28.0	27.0	25.8	25.0
Empty Vehicle Weight (AW0)	32T														
Passenger Weight (AW3)	16T														
Vehicle Strength	2000kN														

Notes and assumptions

EN15227 collision speeds for design scenario #1 (identical train units impacting) for:

C-I (Locomotives, coaches and fixed train units) is 36km/h.

C-II (Metro) and CIII (Tram vehicles, peri-urban tram) is 25km/h.

C-IV (Tramway vehicles) is 15km/h.

Car weight designations:

AW0 – empty car weight

AW1 – weight with seated passenger load

AW2 – weight with average peak-hour passenger load

AW3 – crush loaded weight

Recoverable Coupling Speed – maximum speed in which two identical trains are coupled together with no damage to the coupler (i.e. Gas Hydraulic stroke only).

Coupler Deformation Speed – maximum speed in which two identical trains are coupled together with only controlled damage to coupler (i.e. Gas Hydraulic + Deformation tube stroke).

Maximum Collision Speed – maximum speed in which two identical trains are impacted with controlled damage to only coupler and anti-climber. No damage to car body structure.

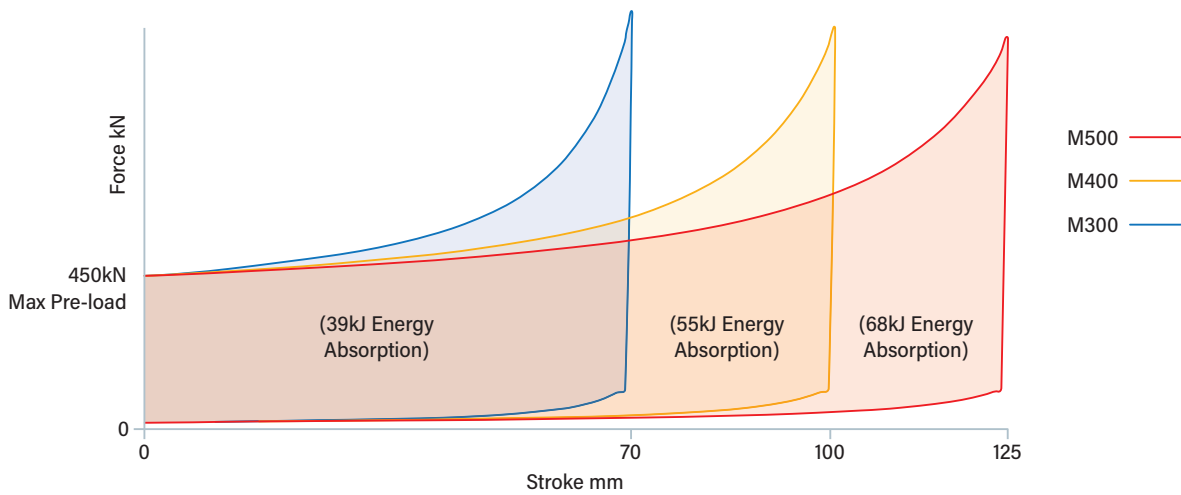
Assumptions made in example simulations:

Effective vehicle mass (AW0) = 100%

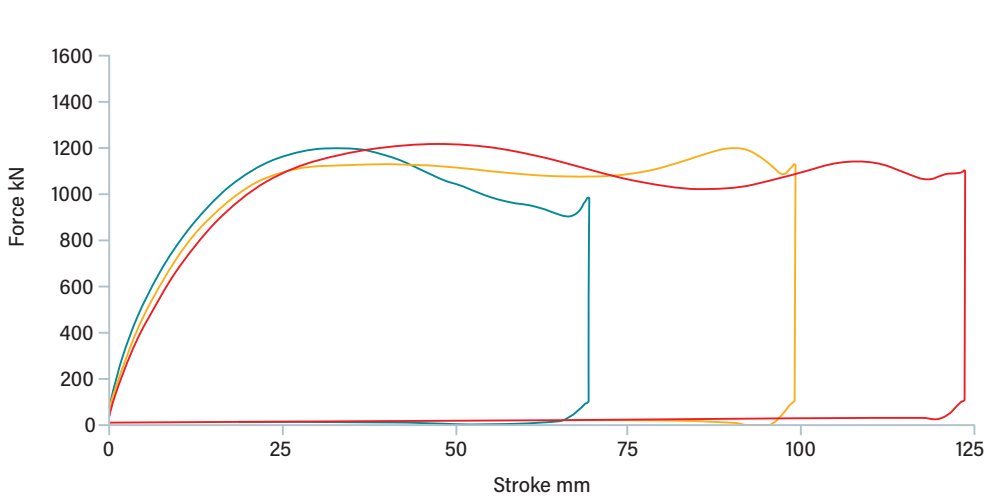
Effective passenger mass = 50%

Sentry™ Coupler 1500 Clamp to Clamp Energy Absorber Specification

Range of available quasi-static characteristics at 4mm/sec



Sentry™ 1500 High Spec examples - Recoverable Coupling Speed (AW3)

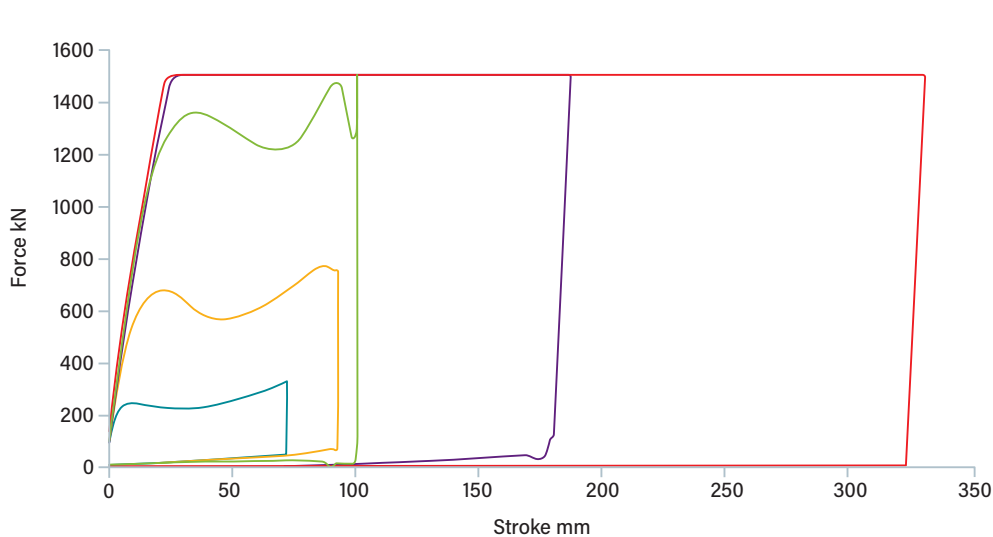


Device Type	Impact Speed Km/h	Energy Absorption (kJ)
M323	9.3	67
M400	15.0	100
M500	15.3	122

Example taken from Hi Spec table for each unit code

Force v Stroke characteristics are shown for front coupler at the Recoverable Coupling Speed under AW3 mass

Oleo Sentry™ 1500 recoverable and non-recoverable performance at different speeds



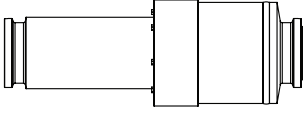
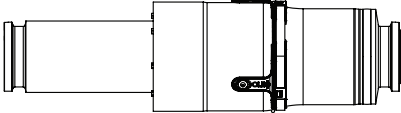
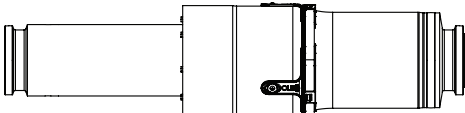
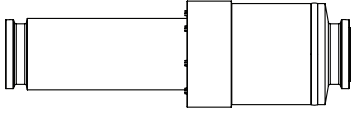
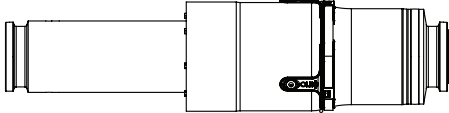
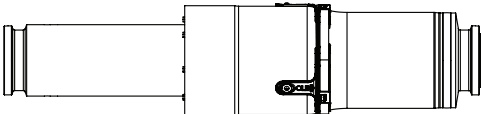
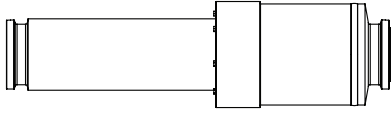
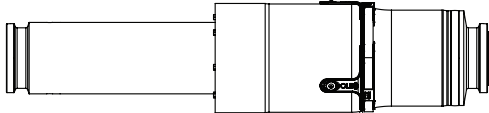
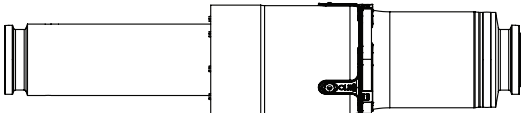
M423	Impact Speed Km/h	Energy Absorption (kJ)
—	5	18
—	10	55
—	15	129
—	20	263
—	23	478

Example shown is M423 Sentry 1500

Impact speeds are of 6 car rake impacting 6 car rake

Force v Stroke characteristics are shown for front coupler only at each speed

Sentry™ Coupler 1500 Clamp to Clamp Energy Absorber Specification

Gas Hydraulic (recoverable) stroke (mm)	Deformation (non recoverable) stroke (mm)	Sentry™ Range	Maximum Force Rating	Energy Absorption (kJ)
			Up to 1500kN	
70			M300	100
	160		M316	340
	230		M323	445
100			M400	145
	160		M416	385
	230		M423	490
125			M500	180
	160		M516	420
	230		M523	525

Buff			Crash		Operating Temperature	Unit Pre-Load	Allowable Static Movement (mm)		
Gas Hydraulic Fully Customisable			Deformation Tube				M300	M400	M500
Stroke	Pre Load	Force	Stroke	Force					
70mm	50kN Min	Up to 1500kN	160mm	Up to 1500kN	+60°C -40°C	50kN	3.0	3.0	3.0
100mm						100kN	3.0	3.0	3.0
125mm	450kN Max	Up to 1500kN	160mm	Up to 1500kN	+60°C -40°C	150kN	3.0	3.0	3.0
						200kN	3.0	3.0	3.0
						250kN	3.0	3.0	3.0
						300kN	3.0	3.0	3.5
						350kN	3.5	3.5	3.5
						400kN	3.5	3.5	4.0
						450kN	3.5	3.5	4.0

Oleo gas hydraulic coupler capsules provide a high start force and guarantees minimal static movement when the gas hydraulic device is installed into the coupler.

The static start force will protect against high draft and snatch loading in normal train running conditions. This can remove the need for heavy draft springs, thereby reducing weight and cost of the complete coupler system.



LEADING THE WORLD IN ENERGY ABSORPTION

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