



Sentry™ Coupler Energy Absorber

For light rail and
metro applications



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:

- Lower Price per Train Set
- Lower Life Cycle Costs
- Weight Saving
- Faster Coupling Speeds
- Reduced Potential Impact Damage
- Increased Passenger Protection

Performance optimisation at no additional cost with pre loads ranging from 40kN 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



Example Train Configurations

Metro (Low Spec)		Description	Unit Code	1D Rail Reference	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	M316X	340_150_70e														
Empty Vehicle Weight (AW0)	33T	Sentry™ Coupler - Intermediate	0	0	8.50	8.50	8.50	8.25	17.75	17.00	16.25	16.00	-	-	-	-		
Passenger Weight (AW3)	16T	Oleo Anti Climber - Front	0	0														
Vehicle Strength	400kN	Oleo Anti Climber - Intermediate	0	0														
Number of vehicles	4	Sentry™ Coupler - Front	M316X	466_84_70a														
Empty Vehicle Weight (AW0)	36T	Sentry™ Coupler - Intermediate	M323X	466_84_70b	8.00	7.75	7.50	7.50	14.75	14.00	13.25	12.75	28.25	27.00	25.75	25.00		
Passenger Weight (AW3)	18T	Oleo Anti Climber - Front	AB80-90	900-800														
Vehicle Strength	800kN	Oleo Anti Climber - Intermediate	AL25-10	100-500														
Number of vehicles	5	Sentry™ Coupler - Front	M523X	466_100_125a														
Empty Vehicle Weight (AW0)	24T	Sentry™ Coupler - Intermediate	M416X	466_100_100a	10.25	10.25	10.00	10.00	18.25	17.00	17.00	16.75	28.74	27.50	26.25	25.00		
Passenger Weight (AW3)	12T	Oleo Anti Climber - Front	AF80-70	700-800														
Vehicle Strength	800kN	Oleo Anti Climber - Intermediate	-	-														
Number of vehicles	6	Sentry™ Coupler - Front	M300X	340_150_70a														
Empty Vehicle Weight (AW0)	47T	Sentry™ Coupler - Intermediate	M300X	340_150_70a	7.50	7.25	7.00	7.00	-	-	-	-	28.50	27.25	26.25	25.00		
Passenger Weight (AW3)	24T	Oleo Anti Climber - Front	AB50-70	700-1000														
Vehicle Strength	800kN	Oleo Anti Climber - Intermediate	AF45-50	500-900														
Number of vehicles	6	Sentry™ Coupler - Front	M416X	466_67_100b														
Empty Vehicle Weight (AW0)	24T	Sentry™ Coupler - Intermediate	M423X	466_67_100a	11.00	10.75	10.50	10.50	18.50	17.50	16.25	16.25	27.50	26.25	25.25	25.00		
Passenger Weight (AW3)	12T	Oleo Anti Climber - Front	AB40-70	700-800														
Vehicle Strength	800kN	Oleo Anti Climber - Intermediate	AL30-10	100-600														
Number of vehicles	8	Sentry™ Coupler - Front	M516X	466_83_125b														
Empty Vehicle Weight (AW0)	24T	Sentry™ Coupler - Intermediate	M516X	466_83_125a	12.75	12.50	12.50	12.00	19.25	18.25	17.50	16.75	28.00	27.00	26.00	25.00		
Passenger Weight (AW3)	12T	Oleo Anti Climber - Front	AF40-60	600-800														
Vehicle Strength	800kN	Oleo Anti Climber - Intermediate	AL30-20	200-600														

Metro (High Spec)		Description	Unit Code	1D Rail Reference	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	4	Sentry™ Coupler - Front	M323X	466_84_70a															
Empty Vehicle Weight (AW0)	40T	Sentry™ Coupler - Intermediate	M316X	466_84_70b	9.75	9.50	9.25	9.25	18.25	17.50	16.25	16.00	27.75	26.50	25.50	25.00			
Passenger Weight (AW3)	20T	Oleo Anti Climber - Front	AF60-70	1000-1200															
Vehicle Strength	1200kN	Oleo Anti Climber - Intermediate	-	-															
Number of vehicles	10	Sentry™ Coupler - Front	M516X	466_83_125a															
Empty Vehicle Weight (AW0)	28T	Sentry™ Coupler - Intermediate	M400X	466_300_100a	12.00	11.75	11.50	11.00	18.75	17.75	17.00	16.75	28.00	26.75	25.75	25.00			
Passenger Weight (AW3)	14T	Oleo Anti Climber - Front	AF60-70	700-1200															
Vehicle Strength	1500kN	Oleo Anti Climber - Intermediate	-	-															
Number of vehicles	15	Sentry™ Coupler - Front	M400X	466_83_100a															
Empty Vehicle Weight (AW0)	24T	Sentry™ Coupler - Intermediate	M400X	466_83_100b	16.00	15.75	15.25	15.00	-	-	-	-	28.75	27.50	26.25	25.00			
Passenger Weight (AW3)	12T	Oleo Anti Climber - Front	AF60-70	700-1200															
Vehicle Strength	1500kN	Oleo Anti Climber - Intermediate	-	-															
Number of vehicles	6	Sentry™ Coupler - Front	M500X	466_83_125b															
Empty Vehicle Weight (AW0)	59T	Sentry™ Coupler - Intermediate	M500X	466_83_125a	15.75	15.50	15.25	15.00	-	-	-	-	27.50	26.25	25.00	25.00			
Passenger Weight (AW3)	30T	Oleo Anti Climber - Front	AF60-40	800-1200															
Vehicle Strength	1500kN	Oleo Anti Climber - Intermediate	-	-															
Number of vehicles	11	Sentry™ Coupler - Front	C157	466_67_100c															
Empty Vehicle Weight (AW0)	59T	Sentry™ Coupler - Intermediate	C157	466_67_100b	14.00	13.75	13.50	13.50	20.50	19.75	18.75	18.75	27.50	26.50	25.50	25.00			
Passenger Weight (AW3)	30T	Oleo Anti Climber - Front	AF60-40	400-1200															
Vehicle Strength	1500kN	Oleo Anti Climber - Intermediate	-	-															
Number of vehicles	8	Sentry™ Coupler - Front	M323X	466_450_70a															
Empty Vehicle Weight (AW0)	50T	Sentry™ Coupler - Intermediate	M323X	466_450_70b	11.00	10.75	10.25	9.25	17.75	16.50	16.00	16.00	28.00	27.00	25.75	25.00			
Passenger Weight (AW3)	25T	Oleo Anti Climber - Front	AF70-40	400-1400															
Vehicle Strength	1500kN	Oleo Anti Climber - Intermediate	AF60-30	300-1200															

Notes and assumptions

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

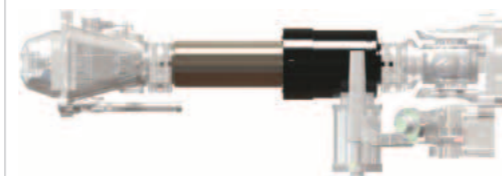
Coupler Deformation Speed - maximum speed in which two identical trains are coupled together with only controlled damage to coupler (i.e. Gas Hydraulic + Deformation stroke of Sentry™ device).

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.

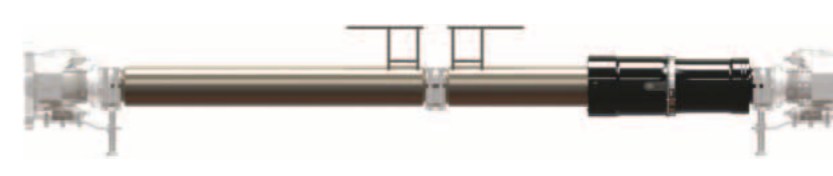
Assumptions made in example simulations:

Effective Vehicle Mass 100% (AW0)
 Effective Passenger Mass 50%

Example 1. Sentry™ Device in Semi Automatic Coupler



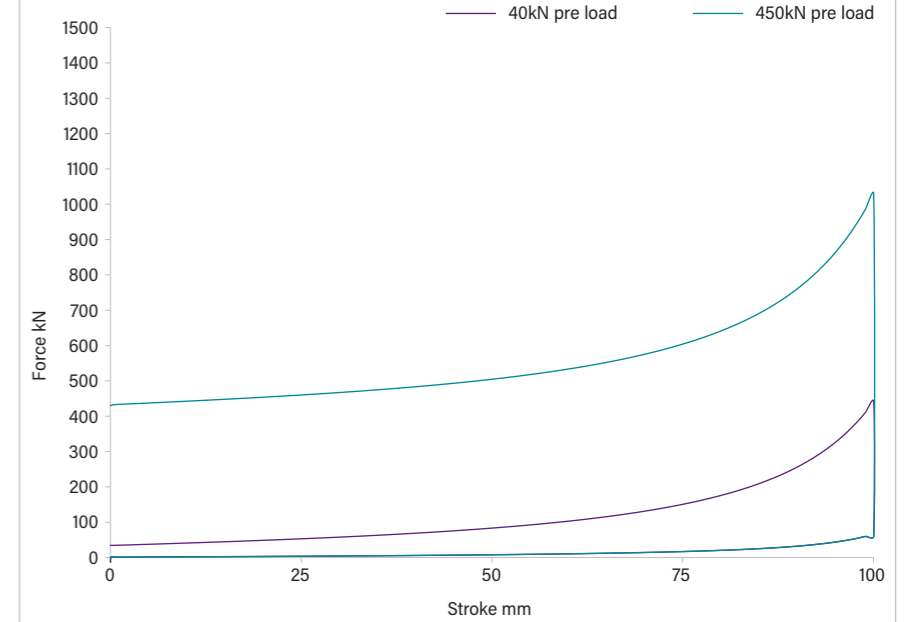
Example 2. Sentry™ Device in Semi Intermediate Pair (1 device per interface)



Example 3. Sentry™ Device in Automatic Coupler

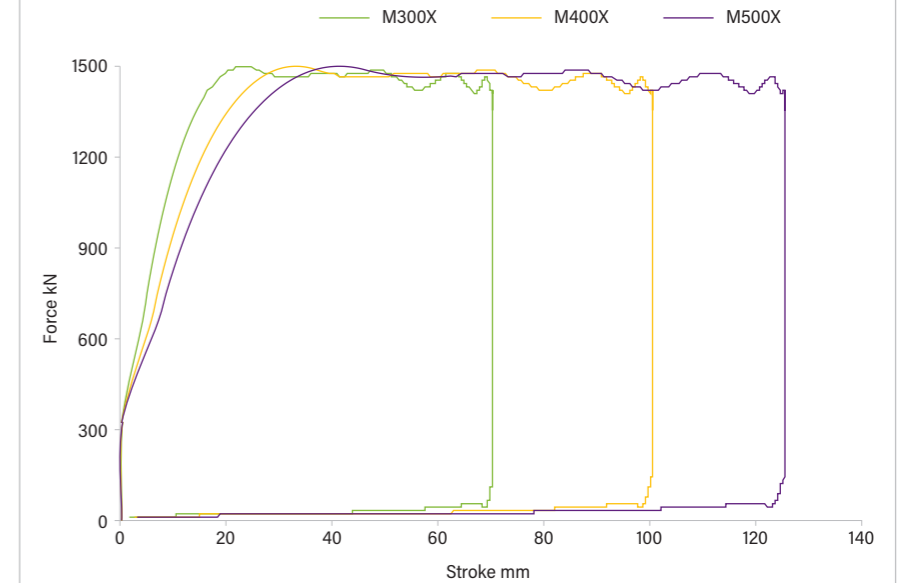


Range of available quasi-static (start force) characteristics












Example shown is for M400X Sentry™ Coupler Energy Absorber

1500kN Typical Dynamic Performance



Idealised Recoverable Force v Stroke curve for Sentry™ devices

Gas Hydraulic (recoverable) stroke (mm)	Deformation (non recoverable) stroke (mm)	Sentry™ Range	Maximum Force Rating
			Up to 1500kN
70	0		M300X
70	160		M316X
70	230		M323X
100	0		M400X
100	160		M416X
100	230		M423X
125	0		M500X
125	160		M516X
125	230		M523X

Buff			Crash		Operating Temperature
Gas Hydraulic Fully Customisable			Deformation Tube		
Stroke	Pre Load	Force	Stroke	Force	
70mm	40kN Min 450kN Max	Up to 1500kN	160mm 230mm	Up to 1500kN	+60°C -40°C
100mm					
125mm					



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