

Appendix B.1 – Technical description

Technical description of the double articulated pocket wagon type [redacted] (Sdggmrss) with three Y25 bogies.

Type drawing according to [redacted] drawing no. [redacted]: pocket wagon [redacted].

Description and technical specification

Double articulated pocket wagon with 3 bogies Y25 Lssi(K)-low and/or Y25 Lssif(K) and/or Y25Lssi(K)-low according to the [redacted] drawing [redacted].

1. General concept of the wagon

Certification according to TSI WAG.

Brake valves located under the frame.

Adjustable hitch with 3 possible positions.

Fundamental characteristics of the double pocket wagon [redacted]:

- semitrailers are fixed and secured to the wagon hitch, only by means of their kingpin. Consequently no wheel securing blocks in the pocket are needed;
- Transport of the mega-trailers (internal loading height 3 m) with lower grapple interfaces for lifting. Consequently the pocket wagons are equipped with lowered outer longitudinal beams, granting space and ease for transhipping of trailers without problems up to a width of 2.6 m;
- Cross beams into the loading pocket lower than 200 mm, in order to obtain more space for lower parts of the semitrailer;
- Conceived for 14.9 m long conventional saddle semitrailers (e.g. Big MAXX with saddle height of 98 cm);
- Loading space of the wagon according to UIC Leaflet 596-5;
- Possibility to load Mega-trailers with water fog minimisation device, according to the EU norms;
- 3 different heights of the hitch: 880 mm for mega-trailers, 980 and 1130 mm for conventional semitrailers;
- Lowered bogies Y25Ls(s)i1 and/or standardized bogie Y25Ls(s)i1(f) with wheel diameter 920 mm;
- Admissible transportation forces for the semitrailer at impact speed up to 7 km/h are assured by means of high-performance buffer 1g;
- Safety concept of the hitch with Crash-elements for the semitrailer king pin protection so that the king pin shall not be damaged without being detected (i.e. during improper shunting,...),

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to avoid accidents during the road transport phase, and the force applied to the kingpin due to rail transport is not exceeding the so called D-Value [kN]. Brake safety valve in case of crash-element deformation: the main brake pipe is vented (emergency braking);

- The wagon is equipped with ISO supporting plates for containers and swap bodies. If not used (i.e. transport of semitrailer), the supporting plates are tilted down into their housings by the longitudinal beams. In the area of the loading pocket, 2 ISO container/swap body supporting plates are placed by each outer longitudinal beam, so that no collision occurs during semitrailer transshipment.

2. Operational profile

The wagons are designed for transport of liftable codified semitrailers and standardized swap bodies / containers overall European railway network with normal track gauge.

The wagon is conceived for a year mileage up to at least 200,000 km per year.

The lifetime of the wagon is at least 20 years.

The wagons are conceived according the applicable codification requirements, so that the codes C and P can be used according to UIC rules without limitations.

The wagons are designed for speed up to at least 120 km/h at axle load of 20 t according to UIC Leaflet 543 Par.1.3.5 $\lambda = 90\%$ (Wagon equipped only with block braking).

Remark: as alternative the brake performance according to UIC 571-4:2011 may be reduced to:

Axle load of 22,5 t $\lambda = 65\%$ according to UIC Leaflet 543.

Loading capacity of the double pocket wagon :

It is possible to load:

- 2 semi-trailers on one wagon up to nominal operational loading 40 t per semitrailer, 3 x 9 t for the axles of 3-axle semi-trailers. Semitrailer with 1 or 2 or 3 axles, with simple or double tyres, with air or with mechanical suspension;
- 4 swap bodies of class C (max. length 4 x 7.82) or 4 2X containers with the weight combination 32 t + 17 t per each half of the wagon. Position of container supporting plates is conceived in order to transport also Schmitz megatrailer;
- 2 swap bodies of class a, type “2R” or 2 4X ISO-containers, 36 t + 34 t (or 2 x 35 t) without intermediate supporting.

3. Basic parameters

Length over buffers	≤ 34,200 mm
Loading length	≥ 2 x 16,185 mm
Distance between bogies pivots	≤ 2 x 14,200 mm
Wheel diameter	920 mm
Bogie wheel-base	1,800 mm
Height of the pocket above top of rail	≤ 270 mm
Height of loading plane for containers	1,135 – 1,155 mm
Usable length of loading space between protection beams	≥ 10,490 mm
Width of space between longitudinal beams	≥ 2,700 mm
Distance from the centre of the bogie pivot up to the loading space	≤ 1,875 mm
Position and length of usable pocket, measured from the bogie pivot on the side of the hitch	from 5,250 mm to 10,060 mm
Effective height of the longitudinal beams and cross beams into the pocket	max. 150 mm
Height of the longitudinal beams above loading surface by the loading pocket where the grapple arms for semitrailer will be used	≤ 630 mm
Adjustable height of the hitch above the loading surface of the pocket:	
Lower position	880 mm
Central position	980 mm
Upper position	1.130 mm

Loading limits:

	A	B	C	D
s	≥ 61 t	≥ 73 t	≥ 85 t	≥ 100 t

SS	≥ 61 t	≥ 73 t	≥ 85 t
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Tare	≤ 34.3 t
Max. axle load	≥ 22.5 t
Max. speed	≥ 120 km/h
Brake	Dako 2 x D - GP - A (K)
1 g high-performance buffer	according to UIC 529-3 – group L – stroke 150 mm
Min. track curve	≤ 75 m
Max. ferry-boat angle	≥ 1°30'

Loading scheme: it is required to edit a loading scheme of the wagon based on the instruction explained in Allegato 3 (Istruzioni per la redazione dello schema di carico). These instructions are available in Italian, English, German and French. It is in particular required that for every loading combination involving more than one ILU on the same wagon-half, the grid of the possible combinations must be composed of at least 10 lines. The loading scheme must be consigned to Mercitalia Intermodal before the subscription of the contract.

4. Specification of subassemblies

4.1 Running gear

The bogies are an “interoperable constituent” according to TSI-WAG.

Track gauge 1.435 mm

Wheel-base 1,800 mm

Axle load 22.5 t at the maximum speed of 100 km/h

Axle load 20.0 t at the maximum speed of 120 km/h (UIC 543, $\lambda = 90\%$)

Type of wheelsets 306 (as listed in VPI/EMG), according to EN 13262; TSI certified; thermostable wheels with low internal constraints (deeply cambered) ER 7 according to UIC 510-5 and EN 13979-1; according to TSI-Wag with axle load 23.5 t.

Wheel tread diameter new/worn 920 / 860 mm

Axle box DB – BA 386 – in UIC execution or equivalent

Axle bearings	roller bearings NJ/NJP 130x240
Axle bearings manufacturer	FAG, SKF, Kinex or ZVL
Wheelset clearance	Lateral 10 mm, Longitudinal 0 mm
Wheel tread profile	UIC S 1002 – 28/30 with 2 mm reduction of wheel flanges
Distance between centres of axle bearings	2,000 mm
Max. axle load of the frame	≥ 22.5 t
Max speed of running dynamical behaviour	≥ 120 km/h
Braking	120 km/h up to 20 t 100 km/h up to 22.5 t
Height of the bogie pivot centre above top of rail	≥ 790 mm
Height of the side bearers above the top of rail	≤ 905 mm
Number of side bearers	2, elastic side bearers according to UIC standards
Distance between side bearers centres	1,700 mm
Vertical clearance of the side bearers	10 ⁺² mm
Bogie pivot upper body	according to UIC 510-1, Annex 9
Suspension ratio	up to axle load 6.62 t 2.5 mm/t for bogie loading in [t]; over 6.62 t 0.96 mm/t for bogie loading in [t]
Static stroke of the spring	38 mm up to axle load 22.5 t
Max. spring stroke	60 mm
Damping	friction damping according to Lenoir principle acting on each axle bearing

The bogie frame is derived from the UIC type bogie Y25L (welded construction made of steel S355J2+N according to the standard EN 10025) and it is conceived in accordance with the UIC Leaflet 510-3 and TSI WAG certified.

Brake rigging 60 kN, 8 pieces of composite brake blocks (2 x Bg Jurid 816M), able to operate in “ss” regime up to the axle load 20.0 t (UIC 543, $\lambda = 90\%$).

Bogies with weighing valves DAKO, type SL2 (UIC type 1).

For interchangeability of the brake blocks downwards spring latches with eye are used.

The bogies will be equipped with dynamically optimised brake blocks holders for composite braking blocks.

Bogie pivot as well as all other joints are secured with two-segment elastic split pins.

Friction bearing of the bogie pivot, as well as friction plates of the lateral side bearers are made of composite material (Railko company).

The side bearer clearance is 10^{+2} mm.

Conditions for bogie operation: the smallest negotiable track curve is at least 75 m. By a track curve of 120 m radius, the inclination angle of $1^{\circ}30'$ must be granted.

4.2 Pneumatic braking system

The double pocket wagons is equipped with a DAKO pneumatic brake having 3 load-proportional braking devices, each of them acts upon 8 composite brake blocks of a bogie. The composite brake blocks Jurid 816M are used in the configuration 2 x Bg.

The braking device in the central bogie consists of No. 1 weighing valve, No. 1 9” brake cylinder and No. 1 DRV10-450H1 slack adjuster.

The braking device in the end bogies consists of No. 1 weighing valve and No. 2 10” brake cylinder equipped with internal slag adjuster.

Each load-proportional braking device:

- Is controlled by a distributor and its braking performance is determined independently for each bogie;
- Is installed in the chassis frame and it consists also on one or two relay valves, one or two limit valves with universal test points for brake testing.

Both distributors are equipped with ON-OFF and G-P change over devices. The three brake devices require an auxiliary air reservoir volume of 120 l plus 75 l. The auxiliary air reservoirs attain the requirements of the standard EN 286-3. Distributors, relay and limit valves, air reservoirs are installed in the wagon frame to be better accessible as possible.

There is a sufficient number of test points for brake tests.

The double pocket wagon is equipped with a 1 1/4" continuous main brake pipe with isolation cocks and brake-hose couplings. The pipes are connected through VEBEO-connections.

The brake force of each bogie is adjusted to loading, through the weighing valve.

4.3 Parking brake

The homologated pocket wagons is are equipped with a parking brake.

The parking brake on central bogie, acting though teeth wheels, braking spindle, etc may be operated from both wagon sides by hand wheels.

4.4 Draw and buffing gears

The draw and buffing gears of the double pocket wagon are dimensioned to grant permissible constraints of the semitrailer at the impact speed of 7 km/h (value for shuttle trains); they consist of:

- No. 1 draw hook according to UIC 520 – EN 15566:2009 – TSI Wag – a=575 mm;
- No. 2 draw gear 1500 kN according to UIC 520 with MINER or DUREL elastic elements, manufacturer Schwab or ETQ/SMW - EN 15566 – TSI Wag;
- No. 2 thread couplings 1350 kN according to UIC 520 – EN 15566:2009 – TSI WAG – Mark U St;
- No. 4 high performance 1g buffers according to UIC 526-3, cat. L – EN15551:2009 – TSI Wag, stroke 150 mm, length 665 m, manufacturer Schwab or ETQ/SMW. Non-rotating buffer plates with dimensions 340 mm x 450 mm, R = 2,750 mm according to UIC 527-1 – EN 15551:2009 – Mark (U).

4.5 Articulated joint

The two wagon frames are mutually connected through an articulation system above the central bogie. This articulated joint transfer between the wagon modules only the longitudinal and transverse forces. The vertical forces are introduced to the central bogie through two lateral upper bearers and through the cross beam to the UIC bogie pivot. The articulation is corresponding to the Talbot solution.

4.6 Wagon frame

Both wagon frames are mutually connected by means of an articulation through the central bogie.

The wagon frame is equipped with integrated pocket to carry the axle assembly of the semitrailer. The pocket is welded to the longitudinal beams.

The nominal operating pocket loading of the 3-axle assembly is 3 x 9 t = 27 t for normal wheel base 1,310 mm. Other combinations comply with EN 12663-2.

The pocket on the wagon can withstand higher axle loads of the second and third axle of the semitrailer, which are caused by longitudinal tilting of the semitrailer typical of air suspensions.

The underframe design avoids deposit of water, to prevent corrosion.

The pocket cross section is optimized for semitrailers with single and twin tyres.

The longitudinal beams are lowered in the area of the pocket, to achieve a good access of the crane grapple arms to the lateral grabbing points of high volume semitrailers, in combination with the lower heights of the hitch.

To transport 4 containers/ swap bodies of class C (up to 7.82 m) and 2 containers of class A (13.6 m and longer), 2 x 10 container supporting plates according to UIC leaflets are installed on the double wagon. The pins arrangement is suitable for 2.60m wide containers/ swap bodies.

The container supporting plates that comply with UIC requirements are located on the outer longitudinal beams, can be turned inside their cast housing by a pin until fixing position and are reinforced, in order to avoid any damage due to improper transshipment by the crane. The dimensioning of the supporting plates must be based on the EN 12663-2 standard and the ERRI B 12/RP17 report.

The outer sides of the wagon consist as much as possible of smooth surfaces. Fixed components and turnable supporting plates are as much as possible against damages due to contact with mobile cranes or components.

The loading space for semitrailer is separated to the bogies by mean of so called protective beams in order to avoid collisions of semitrailers to bogies during transshipment or marshalling.

The wagon frame must be foreseen for later assembling of the automatic draw coupling (Type Z-AK).

The transverse beam by the end bogies are fit with fixed hitch, having three adjustable heights. The hitch is connected to the wagon frame through strong guides so that, in case of accident, it can be exchanged by two persons in 30 minutes. The free spaces of the semitrailer between the kingpin and semitrailer frame according to ISO 1726 standard must be preserved.

The wagon frame is able to withstand impacts from another vehicle with total weight of 80 t without exceeding the permissible stress:

- a) empty wagon up to 12 km/h according to EN 12663-2;
- b) full loaded wagon up to 7 km/h according to EN 12663-2.

4.7 Safety system to preserve the semitrailer

The safety concept is necessary since the semitrailer is fastened to the wagon exclusively through its kingpin. The hitch is a subsystem of the wagon and is equipped with crash elements that prevent the relative longitudinal movement to the wagon (1 Crash-Element for bumping direction).

The crash element, that is conceived to avoid any over solicitation – or internal damaging - of the kingpin, will be activated by a longitudinal dynamical force greater as 0,8 g.

The crash elements permit to obtain a homogenous force up to the total stroke of 140 mm.

The safety concept to protect the semitrailer on the pocket wagon is consisting in following items:

- 1-g hig performance buffers (by Schwab or SMW/ETQ) with a static end force of 600 kN corresponding to a stroke of 150 mm;
- Dimensioning of the semitrailer kingpin according to EU-Guidelines and UIC 596-5 to cope with typical solicitations of the railways operation;
- The crash elements and their configuration on the saddle, in matter of safety components;
- The emergency braking of the double articulated wagon or of the train, in case of permanent deformation of a crash element, due to longitudinal forces overcoming the limits.

4.8 Hitch

The mechanical interface between the hitch and the wagon frame is conceived to avoid any damage of the guide assembled on the wagon frame, in case of sudden improper lifting of the hitch during loading or unloading.

In case of accident, the hitch may be changed completely in 30 min. in an intermodal terminal by two persons using simple tools (with crane available).

All movable parts for operation of the supporting beam (locking of the king pin, adjusting of height) are independent and not part of the wagon frame.

The hitch is designed for three heights – upper position 1,130 mm, central position 980 mm, lower position 880 mm – so that no further lateral clearances, which could worsen the coefficient of the inclination of the semitrailer, are present.

The hitch can be operated simply, intuitively and permanently from both wagon sides.

The hitch has an automatic locking of the kingpin complying to UIC leaflet 571-4.

The supporting beam is suitable also for semitrailers with control wedges according to DIN 47085.

The hitch has a wide supporting base in the transverse direction.

The upper plate of the hitch is movable around the lateral axis of about 3°. The rotation axis lies in the same vertical plane as the interface of the kingpin of the road saddle.

The hitch must be robust and it is resistant to improper operation.

The hitch must have been submitted to tests at the maximal static loading of the saddle with weight of 26 t. The fatigue loading of the saddle must be at least 13 t.

The upper plate of the hitch is characterised by great bending strength, mainly in transverse direction, and it corresponds to the loadings common for a 50 kingpin, complying with the standard DIN 74081.

Centring of the hitch to the kingpin of the semitrailer in the transverse direction is max. +10 mm.

Vertical movement of the hitch is almost linear.

4.9 Accessories, boards, handles, holders

The double pocket wagon is equipped at each front with a left footboard with an handle for shunter according to applicable regulations. At each wagon end, there are 2 hooks for rope and holders of the signal light.

The wagon frame is equipped with lifting points positioned by the cross beam of each bogie by each side.

Each bogie is equipped with earthing cable, connecting the bogie to the wagon frame.

4.10 Coatings and inscriptions

After complete removal of rust by means of shot blasting, the wagon will be painted with a coating suitable for railways vehicles.

Surface preparations: Blast cleaning to a minimum of Sa2^{1/2} in accordance with relevant standards EN ISO 8501-1, EN ISO 8504-2.

Paint type:

- High solid and contains rust preventing pigments;
- Flexible two component polyurethane coating with gloss and colour retention;
- Total thickness of dry coating at least minimal 120 µm.

Weather stability:

- Withstands sunlight and UV radiation in environments with atmospheric corrosivity C3 according to EN ISO 12944-2.

The type and size of defects of coat during the guarantees:

- ISO 4628-2: degree of blistering – max S0;
- ISO 4628-3: degree of rusting – max. Ri2;
- ISO 4628-4: degree of cracking – max. S0;
- ISO 4628-5: degree of flaking – max. S0;
- ISO 4624: adhesion test – min. 5 Mpa.

Remark: defects caused by exposure to chemicals or any mechanical damage may be excluded.

The wagon is completed with inscriptions, sticker boxes and special marks in accordance with relevant standards and regulations of the operator.

The main colour for the wagon frame will be blue RAL 5011, the other colours will be black RAL 9005 (bogie, axle box, draw hooks, black rows of the protruding objects), white RAL 9010 (inscriptions), yellow RAL 1007 (movable parts, yellow rows of the protruding parts), red RAL 3020 (other particulars). The company logo and operators inscriptions are brought according to the drawing of the operator.

4.11 Approval of the wagon and its putting into operation

The present ██████████ wagons, which must have been approved by a NSA according to relevant rules, will be certified according to TSI WAG, and it will be put into operation in the required country of registration. The wagon must have been already homologated at least in a EU country.

4.12 Wagon maintenance

Due to high kilometrage of the wagon and due to very short stay periods of the train in terminal, very quick and low-cost maintenance and repair is important. The wagons must be designed so that as much repairs as possible can be performed during a short period directly on the terminal track.

For instance, exchange of the brake blocks on the assembly track, as well as simple and quick access to the individual brake components and assembly parts.

The wagon maintenance is based upon the principle of simple exchange of lowest replaceable units (LRU), which minimizes wagon transfers to the repair shops.

5. Equipped components

Here is the summary of predefined components, with the indication of the accepted manufacturer (only for the components for which a predefined manufacturer is accepted).

Component	Type	Manufacturer
Wheelsets	306 (TSI certified)	/
Axel Boxes	BA 386 – marked “CEMAT”	/
Bearings	VKL 13-169 (PLC 410-33-2 / PLC 410-34-2)	Kinex (or equivalent products from FAG, SKF or ZVL)
Brake blocks	Jurid 816M	Federal Mogul (before Honeywell)
Distributor	CV1ND23-GP	Dako

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Relais	DSS	Dako
Wheighing valve	SL-2 typ1	Dako
Kink valve (aka Knickventil)	DLV3HL	Dako
Brake adjuster	DRV10-450H2	Dako
Buffers	700-00708-00 (1G)	SMW (or equivalent by Schwab)
Draw gear	455.9.400.04.01.2 (1.35 MN)	MSV
Draw hook	455.0.233.01.015 (1.5 MN)	MSV
Gleiteinlage	N-860-00-15-00-0 Pos. 7	Railko
Stützbock	FAHO 80800-Z / 80800 / 80800.1 / 80800.2	MAZ
Crashelement	080-08-0200 170 kN	ETQ

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