

The 20 new variable-gauge coaches for Swiss passenger rail operator MOB

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Background

For more than 30 years the meter-gauge Montreux – Oberland Bernois Railway line (MOB) has been planning to run through trains on the 53-km long standard-gauge Zweisimmen – Interlaken Ost line owned by rail operator BLS. In 1986 a project was presented for metre-gauge trains along the entire 189-km long Montreux – Zweisimmen – Spiez – Interlaken – Brünig – Lucerne route. The supposed breakthrough came with the project of laying a third rail in 1989. The total investment required for this would have amounted to CHF 71 million. The plan was for construction to begin in 1991 and commissioning in 1995.

As for the through trains, MOB put the locomotives Ge 4/4 8001 – 8004 into service in

1995. These locomotives are designed to be retrofitted to operate on the three-rail section powered by an AC overhead line. Instead of the intended transformer, the locomotives are ballasted with a concrete block.

In 1997 a renewed attempt was made in the form of a scaled-down project costing CHF 56 million. Here there would have been only one single continuous three-track line, without a crossing facility for the metre-gauge trains between Zweisimmen and Interlaken. Given that there were only three daily train pairs with a travel time of just under five hours for the entire route, this was deemed feasible.

In 2007 MOB ordered from Raility the low-floor middle-entry panoramic coaches B 231 – 238, which were delivered between 2010 and 2012. Alstom supplied the bogies.

In 2008 Jean-Marc Forclaz, Chief Engineer at MOB, presented a variable-gauge trailing bogie which he designed himself and designated as EV09 (Écartement Variable). Now four train compositions plus a reserve, each with six coaches, were intended for seven pairs of trains between Montreux and Interlaken Ost. Roll-out of the first trains was to take place as early as 2012 and from 2014 the whole concept was to be realized. The total cost now was put at CHF 44 million, CHF 29 million of which was earmarked for infrastructure. However, the Brünig route was no longer integrated into the concept. On the one hand, this meant that the technical challenge of a brake gear in the variable-gauge trailing bogies could be avoided. On the other hand, MOB extended the "Golden Pass" brand name to its entire company and no longer used the designation only for the Montreux – Lucerne connection.

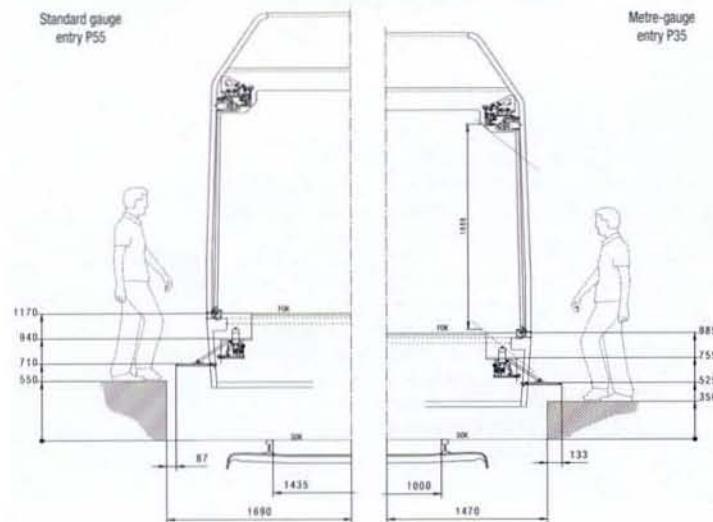
In 2010, a prototype track gauge-changing facility was presented in Montreux. The BDs 220 coach received two variable-gauge trailing bogies which Prose [1] had designed and Alstom had manufactured in Neuhausen. From 2015, in the best case, five pairs of trains between Montreux and Interlaken Ost were now planned daily.



Left: From 2010 onwards test drives with MOB coach BDs 220 equipped with variable-gauge trailing bogies took place. The picture from 14 June 2010 shows BLS locomotives Re 465 008 and Re 425 167 with this coach near Faulensee (photo: U. Jossi, 14 June 2010).

Below left: The entry situation at standard gauge and metre-gauge platforms (drawing: Stadler).

Below right: The driver's cab in the Ast driving trailer on the Interlaken side; in the middle the ETCS display, on the left the speed indicator with Teloc 1500, on the left panel the ZSI 127 train control system (drawing: Stadler).



Artist's impression of the Ast driving trailer (drawing: Stadler / Innova Design Team).

A renewed wave of downsizing followed in 2011: the planned order was cut from 24 newly built coaches to 18. Likewise, the number of coaches to be converted was reduced from 20 to 18. However, rolling stock cost CHF 55 million and infrastructure CHF 42 million. What's more, the majority of trains were now to run only between Montreux and Spiez.

After less public attention had been focused on the project, there followed yet another wave of downsizing in 2014. Now only 16 newly built and ten converted coaches were planned for three compositions, consisting of seven coaches in the formation Ast – As – As catering – Bs low floor – Bs – Bs – Bst, and in addition five reserve coaches. The series 9000 railcars (ABe 4/4 9301 – 9304 + Be 4/4 9201 – 9204), which in the meantime have been supplied by Stadler, were to be deployed as towing vehicles. Now four train pairs were planned daily between Montreux and Interlaken Ost. The travel time was understood to be three hours and ten minutes.

In the meantime the project suffered a severe setback, because doubts began to arise



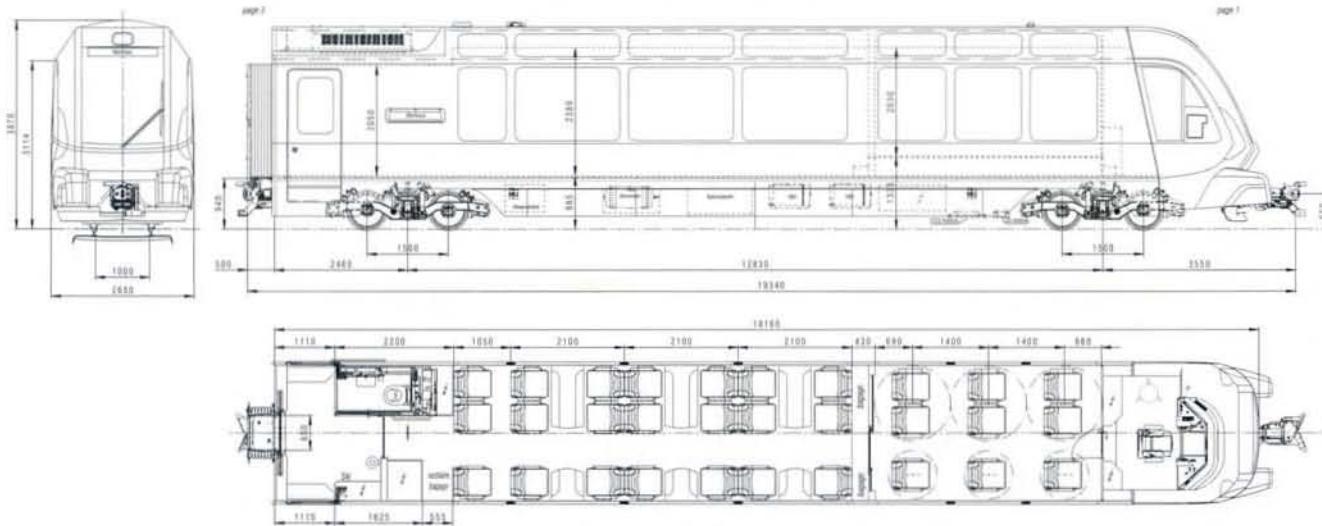
about the project's profitability in the Canton of Bern. A topic of debate was the financing of the gauge-changing facility in Zweifelden station. Finally, however, this hurdle was cleared, too.

In 2016 the situation regarding the rolling stock to be used, which for a long time had been unclear, became more concrete. Now the plan was to procure 16 coaches and

convert 11 coaches, specifically Bs 221 – 223, 228, 231 – 234 and BDs 220, 224 and 225.

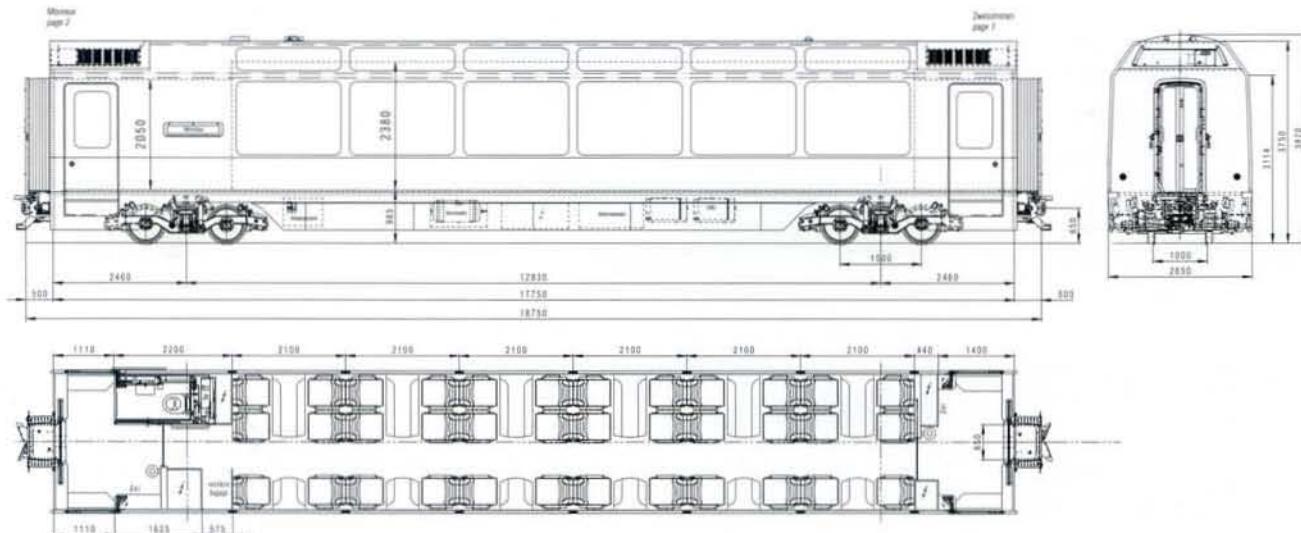
The order

Back in November 2015 there was a public invitation to tender for the supply of new variable-gauge coaches, which fit onto the corresponding Alstom bogies already ordered.



Above: Driving trailer measuring a total length of 19 340 mm, with nine revolving VIP seats and 21 first-class seats (drawing: Stadler).

Bottom: First-class coach with a total length of 18 750 mm and 36 first-class seats (drawing: Stadler).



In April 2016 Stadler was the only manufacturer to submit a tender. This resulted in an order for 20 car bodies in January 2018:

- 8 first-class driving trailers with a VIP compartment	Ast 181 – 188
- 4 first-class coaches	As 191 – 194
- 2 second-class coaches	Bs 281 + 282
- 3 dining cars	WRs 261 – 263
- 3 second-class interface coaches	Bs 291 – 293

Alstom – now owner of the patents to the design – supplies the variable-gauge trailing

bogies, which are fully assembled from its Salzgitter factory. It is worth noting that the short axle spacing required dynamically by the idle wheels is only 1500 mm.

When transferring from metre gauge to standard gauge, the car bodies are lifted by 185 mm in the gauge-changing facility, thus adjusting the vehicle's height to suit the respective platform heights.

As is usual with Stadler, all car bodies consist of welded extruded aluminium profiles and are derived from vehicles already supplied

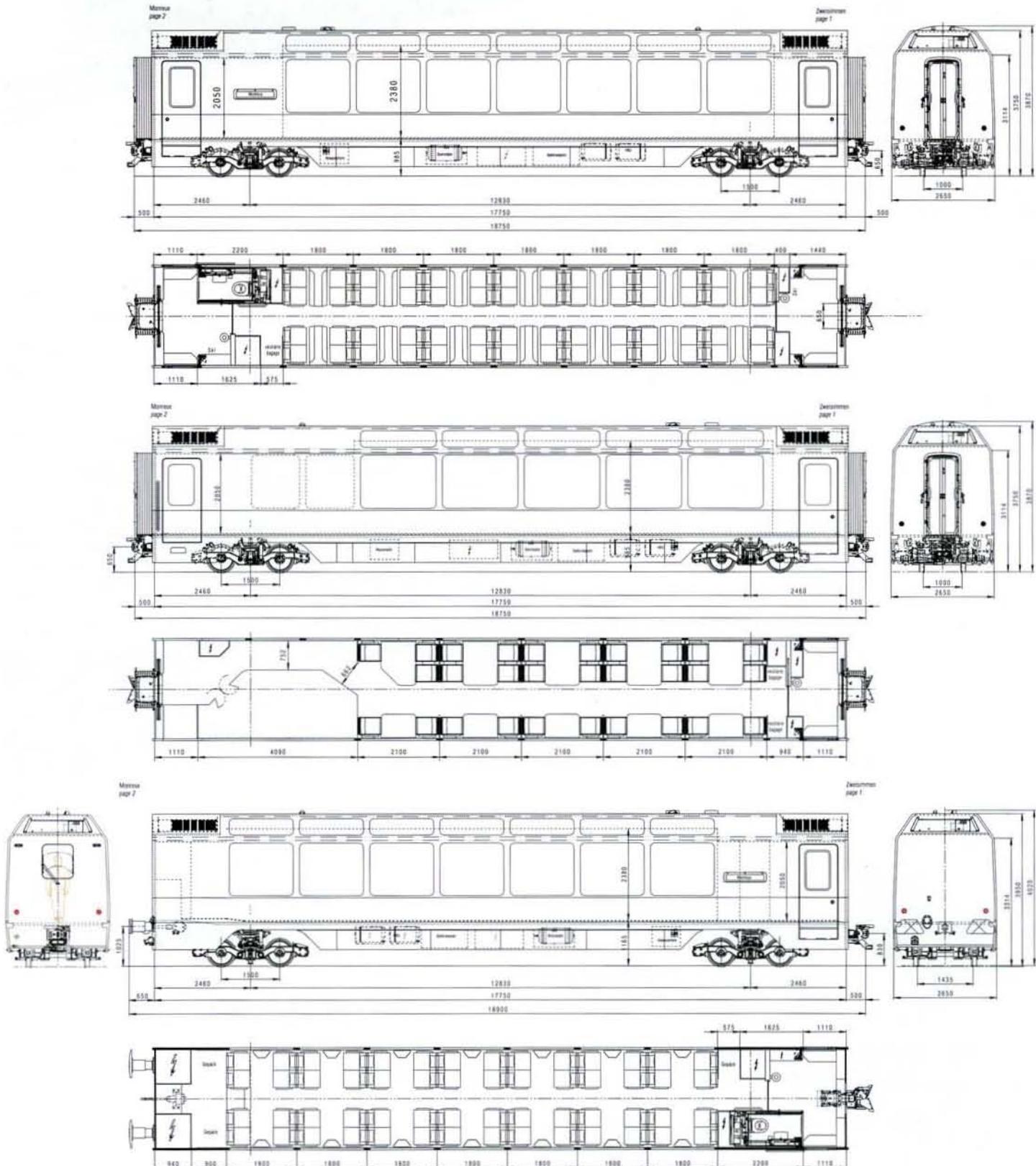
to the Zentralbahn [2], Mariazellerbahn and Glacier Express. The connecting corridors are

From top to bottom:

Second-class coach with a total length of 18 750 mm and 56 second-class seats (drawing: Stadler).

Dining car with a total length of 18 750 mm and 29 seats (drawing: Stadler).

Interface coach with a total length of 18 900 mm and 56 seats. The car end on the Interlaken side has a shunting cab (drawing: Stadler).



Between Montreux and Zweisimmen two MOB 9000 series railcars (blue) haul the gauge-changing train. In Zweisimmen the composition turns into a BLS push-pull train: the BLS locomotive (green) is coupled with the interface car (purple) on the Montreux side and led by the driving trailer (green) on the Spiez – Interlaken side. On the return journey the BLS locomotive hauls the composition to Zweisimmen, and the MOB railcars push them – operated by the driving trailer (blue) – to Montreux (drawing: Minirex).

provided with folding bellows, which have a clear width of 650 mm. To provide lighting only LEDs are used. The car body width is 2650 mm throughout and the distance between bogie pivots is 12 830 mm. The maximum allowed speed is 100 km/h.

The large side windows and roof windows as well as the narrow spars create actual panoramic coaches. As is customary with Stadler, the mullion and the seat divider match. Together with the very generous seat divider of 2100 mm in the dining car in and the first class as well as 1800 mm in the second class, the coaches are among the most comfortable in Europe. There are two air-conditioning units per car body, which supply more or less ambient air corresponding to the amount of CO₂. Each compartment has two 230 V power sockets and a waste bin on both side walls.

The passenger information system conforms to that used by BLS. Apart from the dining car, all coaches each have one destination display per external side wall. In the interior, TFT screens are mounted in pairs on the partition walls. Seat reservations are displayed dynamically on the continuous longitudinal luggage racks.

In the driving trailer a VIP area right behind the driver's cab contains nine seats which are rotatable and can be brought into line with the direction of travel. These seats are even more comfortable than those in the first-class compartments owing to extended spacing.

The driver's cab has its own air-conditioning unit. In the event of an emergency the video signal from all surveillance cameras can be displayed on one of the screens. The cabs on the Montreux side are arranged in the same way as those of the series 9000 railcars, whereas the cabs on the Interlaken side are more complex, because a BLS locomotive can also be navigated from there.

The interface coaches are arranged between the BLS locomotive and the MOB driving trailer. For that reason, there are no connecting doors in these coaches. At the car end with the standard gauge buffers, the platform contains cabinets with elements which are needed for operation on standard gauge lines. These include, for example, the converter, which adjusts the train line voltage from 1000 V / 16.7 Hz to 900 V DC, and the signal converter for one of the four multiple-unit control systems of BLS type Re 465 locomotive. Which system is to be ultimately used is still in the process of being clarified. In order to be able to deploy this composition also

Formation of the gauge-changing trains on the Montreux – Interlaken route

Montreux



Montreux – Zweisimmen route

Zweisimmen change-of-gauge station

Zweisimmen – Interlaken route

with state-of-the-art locomotives in the future, rearrangements will be made for a line for the ep-brake. Various safety installations supplement the technical equipment. Thus, for example, the simultaneous supply of 1000 V / 16.7 Hz by the BLS locomotive and 900 V DC by the MOB railcars into the train line (heating cable) is prevented.

The car end with the automatic Schwab coupling includes a shunting cab, from which also the coupling can be operated. To facilitate this, the platform window is provided with a windscreens wiper and a spotlight focused on the coupling. A lockable panel enables the necessary switchovers for the gauge transition.

Operation

The plan is to have three compositions, each with seven coaches. The nine-car sets previously planned are no longer possible because of the heavier bogies and today's requirements on the body structure for deployment on the standard-gauge sections. In order to be able to implement the concept with seven-car compositions, at least six driving trailers and two interface cars must always be disposable. Two driving trailers will be used as a reserve and/or for other purposes. The

interface cars are used only on the standard-gauge line. The compositions are supplemented by existing, converted coaches. Regarding equal access for mobility-impaired passengers, each composition will be supplemented with at least one coach of the series B 231 – 234 with low-floor access and a spacious toilet. On the MOB route the series 9000 railcars are coupled on the Zweisimmen side. On the standard gauge Zweisimmen – Interlaken the interface car with a BLS locomotive will be provided on the Zweisimmen side.

The operational concept is anticipated to be implemented for the timetable change in December 2020.

Today the MOB has a very heterogeneous and diversely updated fleet. The new procurement will make it possible to modernize and harmonize this substantially.

[1] Forclaz, Jean-Marc; Gyr, Christoph; Weiss, Christoph: Development of the EV09 variable-gauge trailing bogie. Railway Update 9-10/2011, pp. 174 – 178

[2] Feusi, Beat; Zuber, Reinhard; Züger, Gerhard: New rack-and-pinion EMUs ABeh 150, ABeh 160 and ABeh 161 for Zentralbahn. RU 5-6/2017, pp. 88 – 93 as well as 7-8/2017, pp. 122 – 127



On the MOB section two 9000 series (A)Be 4/4 railcars will be lined up "back to back" pulling the gauge-changing "Golden Pass" trains. Until that happens the vehicles, which were put into operation in 2016, will be deployed for another purpose (photo: Ch.-A. Flückiger).