

Steam around Switzerland. Part 8, Schweizerische Centralbahn locomotive-type C4 : winner of the 2001 readers vote for article of the year

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Objektyp: **Article**

Zeitschrift: **Swiss express : the Swiss Railways Society journal**

Band (Jahr): **6 (2000-2002)**

Heft 9

PDF erstellt am: **04.08.2024**

Persistenter Link: <https://doi.org/10.5169/seals-854949>

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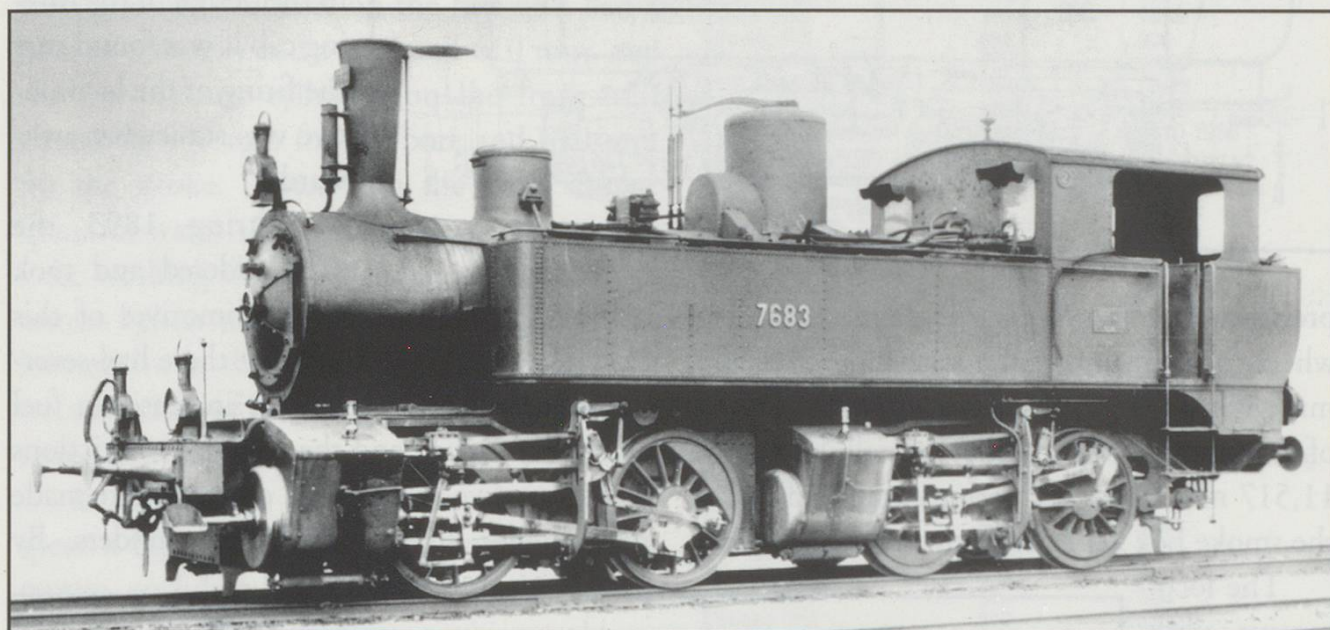
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Malcolm Hardy-Randall STEAM AROUND SWITZERLAND

**PART 8- SCHWEIZERISCHE CENTRALBAHN
LOCOMOTIVE-TYPE C4**


The SCB had need of a locomotive to act as a pilot on passenger trains and to operate freight services from Sissach to Olten over the Hauenstein line with its ruling gradient of 27 per mille. The locomotives under consideration were the 87 tonne D6 2 x 3/3 as built for the Gotthardbahn at a cost of SFr 90 000 or the newly designed C4 2 x 2/2 at a cost of just over SFr 73 000. The SCB chose the latter design and placed an order with Maffei of München for 6 locomotives.

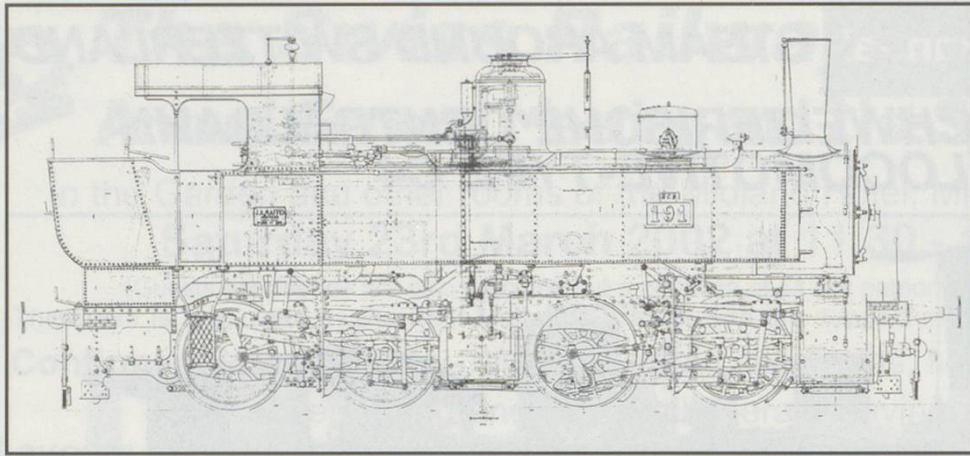
Maffei built the-four cylinder compound locomotive according to the Duplex system designed by Mallet. However, on completion the factory had to deliver them by road as at that time there was no rail connection from the works to the Königs Bayerische Staats Eisenbahn system. It was to be another 10 years before the works-railhead connection was made, so a special wagon drawn by horses was used to carry the locomotives through the streets to the nearest freight yard. The most direct delivery route, at this time, was from München to Lindau and then via the Vorarlbergbahn [Königs Österreich Bahn] to the Swiss border town of St Margrethen and

Maffei built SCB Locomotive type C4 (SBB Ed 2x 2/2) No 195

from there to Olten where the main workshops of the SCB were located.

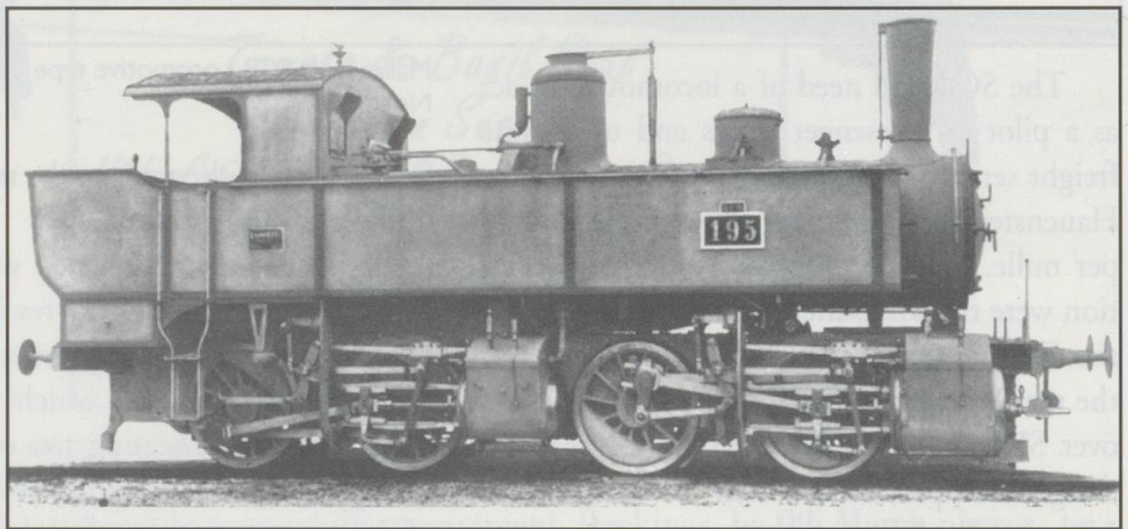
The C4 was constructed with a 169-tube boiler that measured 4 metres in length. The firebox with its 1.8 m² grate area had a total heating area of 7.8 m², which with the boiler tubes gave a total heating area of 113 m². Two spring-controlled safety valves located on top of the large steam controlled the boiler pressure at 12 atmospheres.

The regulator valve mounted on the boiler rear wall controlled steam from the steam dome via a large feed pipe down to the high pressure outside mounted cylinders fitted to the rear unit. The two cylinders powering this unit had a bore of 355 mm and a stroke of 640 mm and were controlled by Walschaerts' valve system. Steam from this unit was fed to the front mounted unit fitted with two outside mounted cylinders. The bore of the low-pressure cylinders was 550 mm and the stroke was 640 mm, and control was as per the rear-mounted unit. On startup only, the front cylinders would be fed with steam at reduced



pressure. The two 1 280 mm diameter driving wheels in each unit had a wheelbase of 1,900 mm giving the locomotive a wheelbase length of 6,200 mm and a total overall length of 11,517 mm. Two leaf springs mounted under the smoke box kept the front unit aligned.

The locomotive with its tractive effort of 7,000 kg achieved a power rating of 650 HP. The driving cab was completely enclosed with storage for

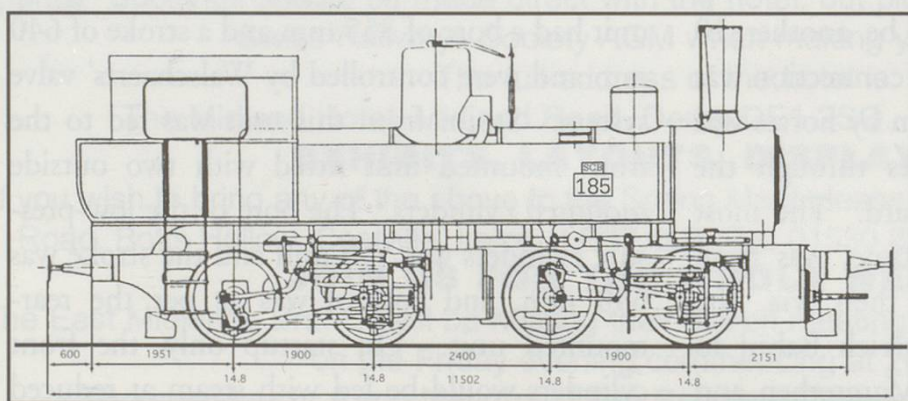


the two tonnes of coal being mounted on the rear cab wall. The five cubic metres of water were stored in side-mounted tanks. Maximum speed was 55 km/h and the trailing load capabilities of the locomotive was 200 tonnes on

delivery of a further ten locomotives of this class, also built by Maffei, but these had several different features. Due to increases in fuel and water carried and the resulting restrictions on locomotive axle weight, changes were made to the boiler, driving wheels and cylinders. By

far the most obvious change was the supply of the locomotive with an open cab.

The boiler length was decreased to 3,850 mm, with just 162 tubes, and the firebox size was also reduced to give a heating area of 7.3 m² with a grate area of 1.7 m². The boiler pressure was increased to 14 atmospheres. Thickness of the main frame was reduced by 1 mm. The driving wheel diameter was reduced to 1,200 mm and fitted closer together which gave a wheelbase of 1,680 mm, thereby bringing the



overall wheelbase down to 5,580 mm. Length overall was down to 10,400 mm.

Cylinder sizes were smaller than those fitted to the original delivery locomotives. The high-pressure cylinders on the rear unit had a bore of 350 mm and a stroke of 610 mm, and the low-pressure cylinders on the front unit measured 540 mm for the bore and 610 mm for the stroke. Even with the extra storage space for water - 7.2 m³ - and coal - 3.3 tonnes - the working weight of the locomotive was 2 tonnes lighter than its predecessors. The latest locomotive in this class was able to produce a tractive effort of 8,000 kg and achieve a power rating of 700 HP.

In view of the fact that these locomotives spent a large portion of their working life in reverse, coal dust being blown into the driving cab and all over the crew was a major problem. Because of this the locomotive was fitted, at a later date, with a fully enclosed cab by the workshops.

On all locomotives of this class a screw brake operated on four brake shoes on the rear driving unit. Westinghouse double acting brake systems were fitted to all locomotives operating on both driving units. A sand dome located just behind the chimney fed sand to the front driving unit. The locomotive was able to provide steam heating for operation on passenger trains. Speed indication was according to the Hausshälter system. SCB staff called these locomotives "the Maffeis".

June 1902 saw the formation of the SBB as an operating company and the stock of the SCB was absorbed into this new Federal railway company. All locomotives were given a new number as shown in the table below, and served for several years on the national network. The first locomotive to be removed from service was 7686 [SCB 186] in 1910 and the last were 7687 & 7696 in 1938. From March 1912 until June 1914 locomotive number 7691 travelled over 52,000 km when it operated on loan to the Mittelthurgaubahn,

Locomotive Data.		
Built by	Maffei of Munich	
Type	C 4	
Nos	181 - 186	187 - 196
SBB Type [from 1902]	Ed 2 x 2/2	
SBB Nos	7681 - 7686	7687 - 7696
	1st Series	2nd Series
Works No	1583 - 1588	1701 - 1710
Date built	1891	1893
Power-HP	650	800
Power-kW	1,049	1,199
T/E at wheel rim-kN	68.67	78.48
Date in Service	1891	1893
Date out of service	1910-17	1910-1938
Max. Speed-km/h	55	
Speed Indicator	Hausshälter	
Driving wheels		
Diameter-mm	1,280	1,200
Rigid Wheelbase-mm	1,900	1,680
Total wheelbase-mm	6,200	5,580
Length overall-mm	11,517	10,400
Loco weight.		
Empty-Tonnes	48.6	44.4
Service-Tonnes	60.4	58.8
Adhesion-Tonnes	60.4	58.8
Water capacity-m ³	5.0	7.2
Coal capacity-Tonnes	2.0	3.3
Brakes	Screw, Westinghouse double acting.	
Cylinders		
Number-Low pressure	2	2
Bore-mm	550	540
Stroke-mm	640	610
Number-High Pressure	2	2
Bore-mm	355	350
Stroke-mm	610	610
Boiler		
Operating pressure-Bars	12	14
Length-mm	4,000	3,850
Tubes	169	162
Firebox, heating area.-m ²	7.8	7.3
Grate area-m ²	1.8	1.7
Trailing load		
Gradient		
10 %-tonnes @ km/h	550@35	550@35
27 %-tonnes @ km/h	180@25	260@25
Construction cost-SFr.	73,600	76,400

and sister locomotive 7684 travelled 2,270 km with the same company during the period 17th April to 30th May 1917.

Locomotives 7687, 7690, 7691 and 7696 ceased service with the SBB in 1915 and were sent for duty on the Pont Brassus railway. During the First World War locomotives numbered 7682 and 7692 were sold to the German Military Transport Command in Bruxelles and reclassified as Class T9 with the numbers 7051 and 7052 respectively. It is believed that locomotives numbered 7684, 7685 and 7694 were also sold to the military command.

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Les locomotives Suisse. 1896. Barbey.

All photographs and drawings are from my collection supplied by SBB Photos.