

= Oslo Metro rolling stock =

The rolling stock of Oslo Metro , Norway has consisted of three classes : T1000 / T1300 , T2000 and MX3000 . The T1000 was built as 162 single cars from 1964 to 1978 . From 1979 to 1985 , 33 new T1300 trains were built , followed by the conversion of 16 T1000s . Six two @-@ car T2000 units were delivered in 1994 . Since 2005 , the first 83 three @-@ car MX3000 units have been replacing the older stock , and the last T1000 was retired in 2007 . From 2010 , only MX3000 @-@ trains are in use . The T1000 / T1300 and T2000 were built by Strømmens Værksted , with motors from Norsk Elektrisk & Brown Boveri (NEBB) and AEG , respectively , and the MX3000 were built by Siemens .

All trains receive 750 V DC from a third rail shoe , while the T1300 and T2000 also have pantographs . This allows the latter to also operate on the suburban lines of the Oslo Tramway , which the western part of the current metro was part of until 1995 . All trains feature automatic train protection and step @-@ free access from the platforms . Trains can operate up to six cars in length . The T1000 / T1300 and MX3000 are capable of 70 kilometres per hour (43 mph) , while the T2000 can operate at 100 kilometres per hour (62 mph) . The T2000 introduced articulated cars , while the MX3000 introduced regenerative brakes and air conditioning . The T1000 / T1300 and MX3000 can be run in multiple with each other , but not with the T2000 . The MX3000 replaced the red color scheme with a white livery .

= = History = =

In 1954 , the Oslo City Council decided to build a four @-@ line metro to the new suburbs to the east of the city center . The plans called for the system to open in 1966 , with the conversion of the Østensjø Line and the Lambertseter Line of the Oslo Tramway , and the new Furuset Line and Grorud Line . The system would feature higher and longer platforms , allowing step @-@ free access to six @-@ car trains , automatic train protection and third @-@ rail power supply . This would make the metro incompatible with the existing tramways in Oslo . The first units in the T1000 series were two single @-@ car prototypes designated T. They were test @-@ run on the existing tramways from 1959 to 1960 , and were then put into service on the Kolsås Line . Prone to technical faults , they were taken out of regular service in 1982 .

Serial production of the T1000 started in 1964 by Strømmens Værksted , NEBB and AEG . Until 1978 , 162 cars were delivered to Oslo Sporveier . These were manufactured in four series , designated T1 through T4 , with minor changes to specifications . During the late 1970s , the western suburban lines which were part of the tramway needed new rolling stock . Oslo Sporveier was at the time considering connecting the metro with these lines , and between 1978 and 1981 , 33 new T1300 cars were built . The only difference from the T1000 was that they had a pantograph that allowed them to operate on the tramways . They also retained the necessary technical appliances to run on the metro . The new T1300 were designated T5 and T6 . From 1985 to 1989 , 16 T4s were rebuilt to T1300 and designated T7 and T8 .

Oslo Sporveier was highly satisfied with the SL79 articulated trams that had been delivered during the 1980s . In 1985 , work started on the development of a modified version for the western suburban lines . The stock on the Holmenkollen and Kolsås Lines were the first that needed to be replaced . At the same time , the company wanted to make the trains compatible with the metro so they could operate on both systems . The new stock was considered to be a trial ; if it met performance expectations , future orders could be made to replace the T1000 stock , after the latter reached the end of its economical life in about 2000 . The required specification for the new train was published in October 1988 .

In the late 1980s , it was decided to upgrade the Røa and Sognsvann Lines to metro standard . This would allow them to use T1000 stock . Twelve T2000 were ordered in 1991 , and would be sufficient to operate the services on the Holmenkollen and Kolsås Lines , that would retain an overhead wire . The development costs for the T2000 were in part subsidized by the government , as the high @-@ tech product from Strømmens Verksted (by then part of the ABB Group) and

AEG was seen as a future export product . The trains were delivered in 1994 and taken into use in 1995 . The same year , the metro started operating all services through the city center , connecting the western and eastern networks .

In 1996 , the work to establish a financing package for new investments in public transport in Akershus and Oslo started . Oslo Package 2 was passed in 2001 and allowed municipal and state grants to be supplemented by increased fare and toll road revenue to finance , among other things , new trains for the metro . The initial order by Oslo Sporveier in 2003 from Siemens was for 33 units (99 cars) , plus options for further orders . In 2005 , the city council voted to replace all existing T1000 and T1300 stock with the MX3000 , increasing the quantity by another 30 units . Two test units were delivered in October 2005 , with the first serial deliveries in April 2007 . With the delivery of the new white and gray trains , Oslo Sporveier received criticism that they had been disloyal to the old red color of the metro , and that they did not follow up on their former design concept from the 1960s through the 1980s . Following the 2006 decision to convert the Kolsås Line to metro standard , Akershus County Municipality announced they would order five units .

In November 2006 , the city government proposed that the maintenance of the new trains be privatized . This resulted in protests from the employees , who campaigned by refusing to work overtime . As a result , after a few weeks , the company lacked 57 trains to provide adequate service . The issue was solved when the socialist opposition parties along with the Liberal Party agreed to postpone the matter until after all the new trains were delivered in 2009 . As part of the agreement , a new limited company , Oslo Vognselskap , wholly owned by Kollektivtransportproduksjon , would take ownership of all metro trains and trams used by the operating companies . Responsibility for the debt accumulated for buying the trains is to be managed by Oslo Vognselskap , while operation and management of the maintenance contracts was transferred to Oslo T @-@ banedrift .

In 2008 , the city council in Oslo decided to upgrade the Holmenkollen Line to metro standard , to allow six @-@ car MX3000 trains to be the main mode of transport to Holmenkollen Ski Jump during the FIS Nordic World Ski Championships 2011 . This will allow 9 @,@ 000 people per hour to be transported to the sports venue . The first T1000 was scrapped on 14 March 2007 , and the last T1000 train was run on 19 July 2009 . Oslo Tramway Museum has preserved six T1000 cars , no . 1002 (T1 @-@ 2) , 1018 (T1 @-@ 2) , 1076 (T1 @-@ 1) , 1092 (T2) , 1129 (T3) and 1141 (T4) . In 2008 , the T2000 were taken out of service while the Holmenkollen Line was being renovated . In 2010 , Ruten decided that they would not put back into service , largely because of high maintenance costs and low availability of spare parts because of the technically complex design and small series . The last T1300 was retired on 22 May 2010 , after which only MX3000 units are used on the metro .

= = Specifications = =

The Oslo Metro uses 750 volt direct current fed to the train via a third rail , along a standard gauge track . The system is not compatible to the Oslo Tramway , but the T1300 and T2000 have been built to run on both the suburban lines of the tramway and the metro . The platforms are 110 metres (360 ft) long , and the height of the train floors are 1 @.@ 12 meters (3 ft 8 in) above the track , allowing step @-@ free access to the platforms .

The trains ' speed are controlled by an automatic train protection (ATP) system . The speed codes are transferred from the ATP points in the infrastructure , using 75 hertz pulses in the tracks . The trains pick up the signals via antennas . The speed codes are 15 km / h (9 mph) , 30 km / h (19 mph) , 50 km / h (31 mph) and 70 km / h (43 mph) . They are communicated to the engineer via signals in the driver 's cab ; in addition , the system will automatically reduce the speed , should the limit be exceeded . The driver can put the trains in an automatic mode , where the train itself adjusts its speed to the limit . The driver is always responsible for starting and halting the train at stations .

= = = T1000 = = =

The T1000 were built by Strømmens Værksted and is 17 @,@ 000 millimetres (55 ft 9 in) long , 3

@, @ 200 millimetres (10 ft 6 in) wide and 3 @, @ 650 millimetres (12 ft 0 in) high . Each car is equipped with two bogies . The axle distance is 2 @, @ 170 millimetres (7 ft 1 in) , the bogie distance is 11 @, @ 000 millimetres (36 ft 1 in) and the wheel diameter is 820 millimetres (2 ft 8 in) . The cars are equipped with four 98 @-@ kilowatt (131 hp) motors each from NEBB , giving a maximum speed of 70 kilometres per hour (43 mph) . The weight is 27 @. @ 740 tonnes (27 @. @ 302 long tons ; 30 @. @ 578 short tons) and the electrical equipment was delivered by AEG . The T1300 differ in that they have a pantograph and were built for conductors . The seating also varies : T1000 has a total capacity of 180 passengers , of which 63 can sit . T5 has the same total capacity , but 70 people can sit . T6 has a capacity for 154 people , of which 64 can be seated . T7 and T8 have a capacity for 177 passengers , of which 60 can be seated . All models are capable of operating six cars in multiple , although they are commonly used in shorter configurations .

== = T2000 == =

The T2000 was built by Strømmens Værksted and AEG as twin @-@ car units . Each car 's aluminum body is 18 @, @ 000 millimetres (59 ft 1 in) long , 3 @, @ 650 millimetres (12 ft 0 in) high and 3 @, @ 300 millimetres (10 ft 10 in) wide . The empty weight of a car is 31 tonnes (31 long tons ; 34 short tons) . Capacity is for 60 seated and 125 standing passengers . There is a driver 's cabin at one end of each car . Passengers sit in two compartments ; the forward has conventional 2 + 2 seating , while the back section has 1 + 2 + 1 seating with two aisles . Both cars have power on all axles , giving a Bo 'Bo ' wheel arrangement . Four motors , each with 143 kilowatts (192 hp) , power the car , giving a top speed of 100 km / h (62 mph) and an acceleration of 1 @. @ 3 m / s² (4 @. @ 3 ft / s²) . The trains are equipped with both pantograph and third @-@ rail shoe . The trains cannot be connected for multiple running with the T1000 trains .

== = MX3000 == =

The MX3000 is a three @-@ car electric multiple unit built exclusively for the Oslo Metro by Siemens in Vienna , Austria . The units are designed by Porsche Design Studio , and have a body in aluminum . A three @-@ car train is 54 @. @ 14 meters (177 ft 7 in) long ; the end cars are 18 @. @ 11 meters (59 ft 5 in) long each , while the center car is 17 @. @ 92 meters (58 ft 10 in) long . The cars are 3 @. @ 16 meters (10 ft 4 in) wide and 3 @. @ 68 meters (12 @. @ 1 ft) tall . An empty three @-@ car unit weighs 98 tonnes (96 long tons ; 108 short tons) , while it with full payload weighs 147 tonnes (145 long tons ; 162 short tons) .

Each three @-@ car unit has 138 seats , and a total capacity of 493 riders . There are three doors on each side of each car , measuring 1 @, @ 300 millimeters (4 ft 3 in) wide and 1 @, @ 900 millimeters (6 ft 3 in) high . In service , the units either run single (with three cars) or two units in multiple (with six cars) . Each car is equipped with four three @-@ phase asynchronous 140 @-@ kilowatt (190 hp) motors , giving each three @-@ car unit a power output of 1 @, @ 680 kilowatts (2 @, @ 250 hp) .

The MX3000 introduced a number of technical innovations to the metro . Regenerative brakes allow the dynamic brakes to feed the braking energy back to the power system via the third rail . The passengers also have air conditioning . The driver 's cabs are more ergonomic than in the older models , and the mirrors to monitor the platforms have been replaced with cameras and screens . The trains ' livery is white with gray detailing , instead of the former models ' red with blue detailing . For use in areas without a third rail , such as at depots , the trains are equipped with a 110 V battery . This will remove the need for shunting at the depots and cut costs .