= NSB Di 6 =

NSB Di 6 , later designated ME 26 and DE 2700 , is a class of twelve diesel @-@ electric locomotives built by Siemens for the Norwegian State Railways (NSB) . The prime mover provides a power output of 2 @,@ 650 kilowatts (3 @,@ 550 hp) , a starting traction effort of 400 kilonewtons (90 @,@ 000 lbf) and a maximum speed of 160 kilometres per hour (99 mph) . They have a Co 'Co ' wheel arrangement . The bidirectional locomotives were designed for use with both passenger and freight trains .

The units were ordered by NSB in 1992 as replacements for the aging Di 3 , and were particularly intended for use on the Nordland Line and to a lesser extent on the Røros Line . Construction was done by Maschinenbau Kiel (MaK) in Kiel , Germany , which was then part of Siemens Schienenfahrzeugtechnik . The class is largely based on the MaK @-@ built DB Class 240 , with each unit costing 32 million Norwegian krone (NOK) . The first units were delivered in March 1996 , one year after schedule , but were plagued with faults . By 1999 , the entire order was terminated and the locomotives returned to Germany . They were taken over by locomotive lessor Dispolok and were used by various Germany railway companies . Ownership was taken over by Vossloh in 2003 , after which most of the class were leased to German passenger train operator Nord @-@ Ostsee @-@ Bahn . In 2008 , three units returned to Norway and are used by Cargolink for freight trains .

= = History = =

During the late 1980s , the Norwegian State Railways sought a new locomotive type to replace its aging fleet of Di 3 diesel @-@ electric locomotives , which made up the back @-@ bone of the dieselized operations . The new locomotives were planned for use as freight and passenger trains on the Nordland Line , and to a lesser extent on the Røros Line . In 1980 , NSB had taken delivery of five Di 4 from Henschel . Originally there were plans to order additional Di 4 units , but this was discarded and instead a new class was pursued , as NSB wanted similar , but slightly more modern , locomotives .

A MaK @-@ built DB Class 240 locomotive was test @-@ run in Norway during 1990 . On 23 November 1992 , NSB 's board decided to order ten similar units . The order was later expanded with another two units because NSB was offered a lower price than originally stipulated . The Di 6 would have motors from Siemens , who had bought MaK , and would be optimized for Norwegian conditions and standards . The contract was worth NOK 380 million , or NOK 32 million per unit . At the same time , NSB also made an order for 20 smaller diesel @-@ electric locomotives from MaK , the Di 8 . Between the two new classes , they were to replace all the Di 3s .

The contract for the Di 6 called for the first delivery in February 1995 . Several components were to be manufactured by NSB , including the fuel tanks , sandboxes , engine frames , alternators and some components for the bogies . The first locomotive was delivered on 7 March 1996 , but quickly proved to not meet the specifications in the contract . In particular , the locomotives had too high fuel consumption and the bogies had faults , as they had too high track forces . Both of these issues were difficult to solve . The Di 6 also had problems with overheating , in particular in the main alternators , the oil cooler and the brakes . The on @-@ board computer failed when the outdoor temperature fell too low .

On 23 September 1996 , NSB 's administration recommended that the purchase be terminated . However , this was put on hold by the board . Instead , a renegotiated contract was signed , whereby Siemens was obliged to deliver the locomotives , as specified , by mid @-@ 1997 . If not , the two parties agreed that the contract would be terminated . By late 1996 , five locomotives had been delivered , and these were returned to Kiel for upgrades . The first returned to Norway on 30 November 1996 , after the ventilator motors had been upgraded , new oil coolers installed and other minor upgrades had been performed . From January 1997 , they were put into regular use with freight trains on the Nordland Line . In mid @-@ 1997 , number 664 was damaged in a fire caused by an incorrectly mounted exhaust system . In October 1997 , cracks were found in the wheels , and all units were taken out of service while they were being fixed .

On 17 December 1997 , NSB 's board decided to purchase eleven of the locomotives , excluding number 664 . This was based on an agreement whereby NSB would receive compensation for the incurred losses owing to late delivery and under @-@ performance . Siemens guaranteed that ten of eleven locomotives would be operational at any time . All units were again grounded in January 1998 , following two fires . Siemens had between 15 and 20 employees stationed in Trondheim to fix the issues . Regularity on the Nordland Line plummeted from 67 to 46 percent with the introduction of Di 6 . NSB was forced to keep 15 Di 3s , which were up to 42 years old , in operational condition to keep services running . The extra costs of keeping the Di 3s running were about NOK 50 million per year . These costs would continue until NSB could take delivery of new locomotives , which could take up to three years from the time of order . One contributing factor was a 25 percent extra wage for engineers for having above @-@ regulation noise levels in the Di 3 cabs . Two Di 3s were often run along with a Di 6 in a train as backup ; should the Di 6 fail , the Di 3 would continue hauling the train .

On 28 April 1998 , NSB officially announced to Siemens that they might terminate the purchase contract , describing the locomotives as having " fundamental construction faults " By July 1998 , nine of the eleven units were out of service and one was returned to Germany for repairs after a fire . When the only operational unit broke down , NSB 's board sent a bill for the purchase price plus interest to Siemens , stating that if it was not paid within a week , the issue would be brought to court .

Siemens stated that they would not be able to have the locomotives operational until mid @-@ 1999 . By February 1999 , Siemens had given up trying to fix the locomotives , although they had established that the main fault lay in the generators . The issue never reached the courts . On 5 May 1999 , the companies announcement that they had reached an agreement for the trains to be returned to Siemens , and NOK 485 million be compensated to NSB . This was in addition to NOK 80 million which had already been given as discount . In addition to the purchase price , the compensation included interest and coverage for NSB 's extra expenses . The locomotives were immediately dismounted of NSB @-@ owned equipment and on 20 May sent by ship to Hamburg .

A major contributor to the faults lay in Siemen 's 1992 take @-@ over of MaK , in which a large number of veteran employees , who had the necessary competence to build diesel @-@ locomotives , were retired . In 1998 , Siemens sold the Kiel facilities to Vossloh . Following the return to Germany , the locomotives were modified to meet German standards and designed ME 26 . They were made narrower by removing outside stairs and railings , and moving lights to meet International Union of Railways standards . There were also changes to the cab walls , with internal railings added and the toilets removed . The speed was also reduced to 140 km / h (87 mph) , although this has later been reverted . Number 664 was rebuilt in Kiel , but because of the lack of capacity at MaK , the remaining units were rebuilt by DSB in Copenhagen . After the upgrades , ownership was transferred to Dispolok , a leasing pool originally owned by Siemens .

The first two units were leased to Denmark 's Privatbanen Sønderjylland . Later lessees of one or more units included Cargolink , Chemins de Fer Luxembourgeois (CFL) , CTL Logistics , Hoyer Railserv , HSL @-@ Logistik , KEP Logistik , NetLog Netzwerklogistik , Neuss @-@ Düsseldorfer Häfen , Norddeutsche Eisenbahngesellschaft , Osthavelländische Eisenbahn , the Port of Kiel , RSE Cargo , Regental Bahnbetriebs , Schneider & Schneider and Verkehrsbetriebe Peine @-@ Salzgitter .

Six units were leased by CFL between 2000 and 2004 . The Luxembourgian State Railways were in need of new diesel locomotives to overcome the three different electrification systems in use . Because of a three @-@ year waiting time for new locomotives , CFL leased the Di 6 units for freight trains between Esch @-@ sur @-@ Alzette , Bettembourg and Mertert . In November 2003 , the locomotives were sold to Vossloh and given the designation DE 2700 . Since 2006 , the main leaser is the Veolia Verkehr @-@ owned Nord @-@ Ostsee @-@ Bahn , which operates passenger trains in Schleswig @-@ Holstein , Germany . Eight locomotives are used to haul six to ten @-@ car passengers trains on the route between Hamburg and Sylt . In 2008 , three locomotives returned to Norway , when Cargolink leased them for their new autorack freight operations . In 2009 , NOB transferred its ninth unit to HSL Logistik .

= = Specifications = =

The diesel @-@ electric locomotive has a MaK 12 @-@ cylinder 12M282 diesel prime mover which provides a power output of 2 @,@ 650 kilowatts (3 @,@ 550 hp) at 1000 revolutions per minute . Transmission of power is by Siemens @-@ built bogie @-@ mounted three phase asynchronous induction type double pole pair traction motors which power the wheels via reduction gear and a hollow quill drive connected to the wheels at both ends via resilient links . The six traction motors are supplied with three @-@ phase electrical power by gate turn @-@ off thyristor controlled inverters using pulse @-@ width modulation controlled by a Siemens ' Sibas @-@ 32 traction control electronics . The electronic inverters are cooled by evaporated fluid , the traction motors are air cooled by external fans .

The units have a starting traction effort of 400 kilonewtons (90 @,@ 000 lbf) and a continuous traction effort of 283 kilonewtons (64 @,@ 000 lbf) . Maximum operating speed is 160 kilometers per hour (99 mph) . The locomotives each have two bogies , each with three powered standard gauge axles , giving a Co 'Co ' wheel arrangement . The bogies are equipped with two @-@ stage suspension . The bogies have a wheelbase between the outer wheels of 3 @.@ 940 meters (12 @.@ 93 ft) and a distance between the bogie centers of 11 @.@ 750 meters (38 @.@ 55 ft) . The wheels have a diameter of 1 @,@ 060 millimeters (41 @.@ 73 in) when new . The locomotive has a minimum curve radius of 100 meters (328 ft) .

The bidirectional locomotives are 20 @.@ 960 meters (68 ft 9 @.@ 2 in) long , 3 @.@ 000 meters (9 ft 10 @.@ 1 in) wide , 4 @.@ 385 meters (14 ft 4 @.@ 6 in) tall and weigh 122 tonnes (120 long tons ; 134 short tons) . The fuel capacity is 5 @,@ 000 liters (1 @,@ 100 imp gal ; 1 @,@ 300 U.S. gal) . The units were originally equipped with a galley and toilet for the engineer . The locomotive has head end power , allowing it to haul passenger trains in addition to freight trains . NSB 's Di 3 , Di 4 , Di 6 and Di 8 can all be run with together with up to three locomotives in multiple .