SIEMENS

Diesel-Electric Locomotive SD90MAC with Three-Phase Drive

Technical Information

Wheel arrangement	Co'Co'	0-6-6-0
Track gauge	1 435 mm	4 ft 8.5 in
Weight	190.5 t	420 000 lbs
Length over couplers	24 434 mm	80 ft 2 in
Wheel diameter	1 118 mm	44 in
Gear ratio	83 : 16	5.19 : 1
Maximum speed	128 km/h	80 mph
Diesel engine Type Rating	 EMD 16-710 G3B 4 300 HP/3 208 kW at 950 rpm	
Diesel engine Type Rating	 EMD H-engine 6 000 HP/4 476 kW at 1 000 rpm	
Starting tractive effort	820 kN (890 kN)	185 000 lbs (200 000 lbs)
Continuous tractive effort	654 kN (734 kN)	147 000 lbs (165 000 lbs)
Braking effort	510 kN	115 000 lbs

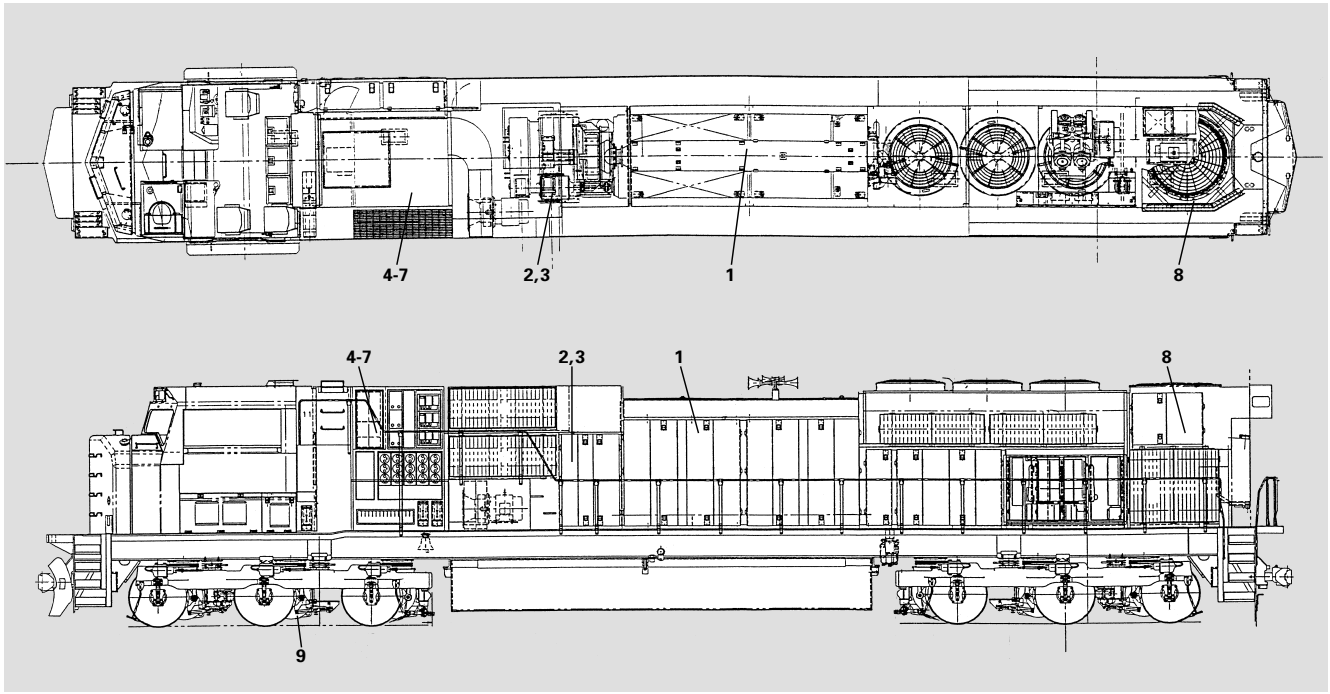
The SD90MAC's are the perfect multi-purpose locomotives providing high starting and continuous tractive efforts as well as high speeds. Therefore all areas of operation can be covered.

This is possible by using modern three phase AC technology:

- Pulse-width modulated (PWM) inverters with GTO thyristors using evaporation cooling proven in thousands of applications
- Induction traction motors in axle-hung, nose-suspended design
- SIBAS® 16 microcomputer traction control

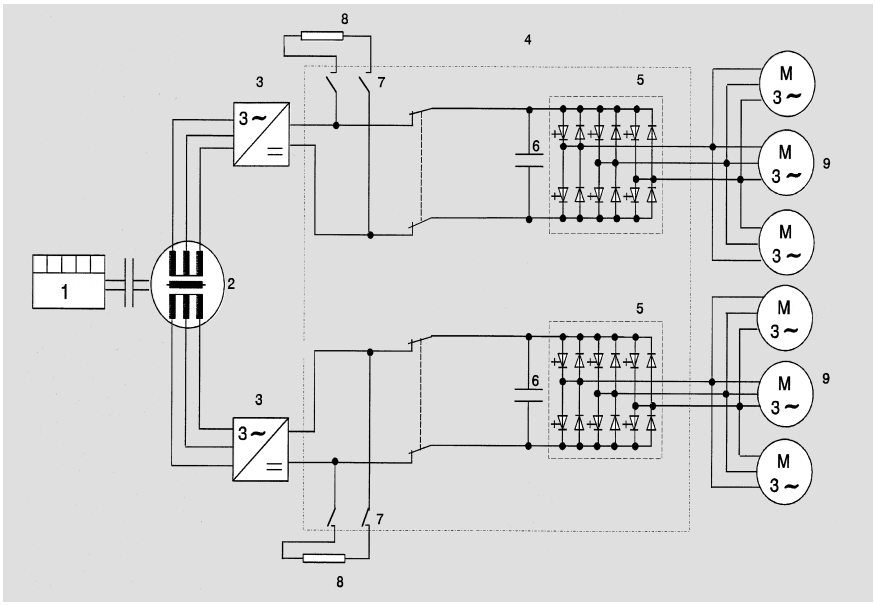
Development and manufacturing:
Siemens AG Erlangen, Germany
and Electro-Motive Division
of General Motors Corp. (EMD)

The locomotive can be equipped with 4 300 THP engine or with the four stroke "H" engine with 6 000 THP. Data with 6 000 THP engine are given in brackets.



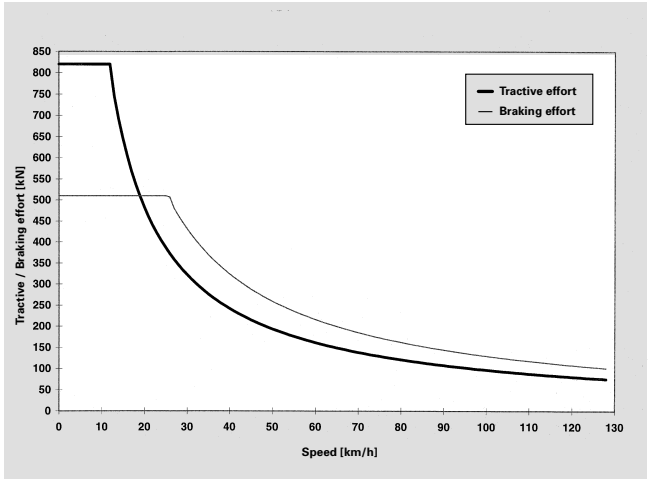
General view

▲
1 Diesel engine
2 Generator
3 Rectifier
4 Traction converter cubicle
5 PWM inverter
6 DC link capacitor
7 Braking contactor
8 Braking resistor
9 Traction motor ▶

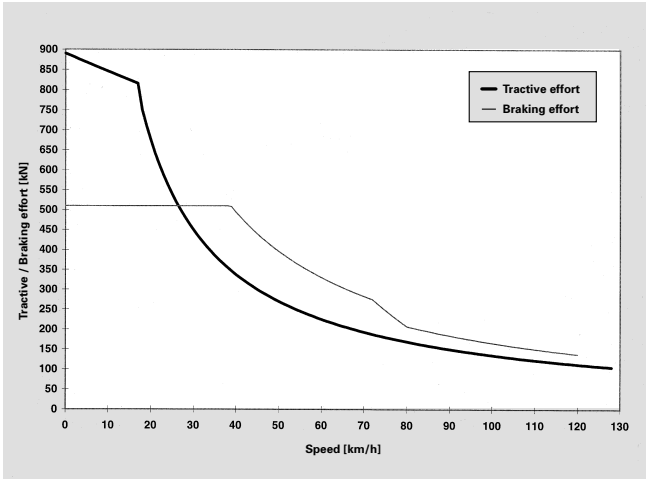


Main circuit diagram

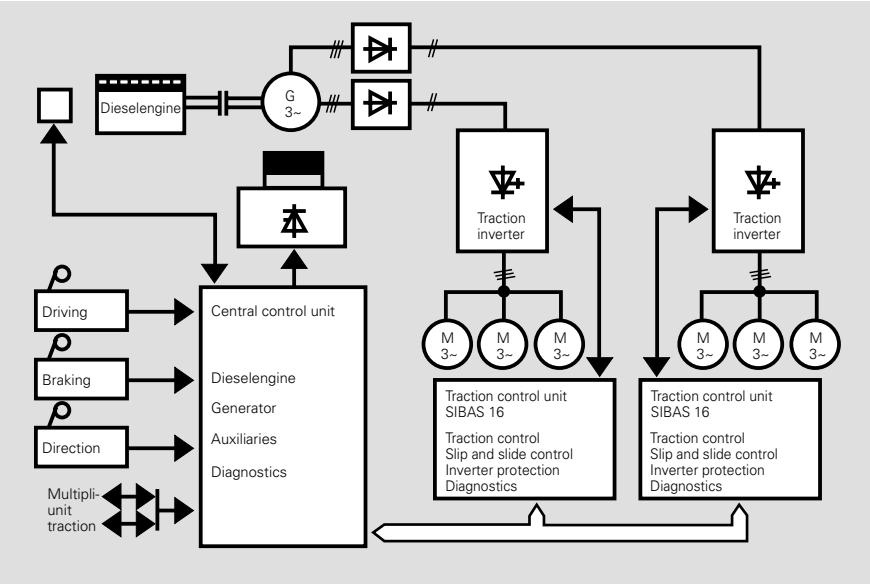
Tractive and braking effort diagrams



SD90MAC with 4 300 HP



SD90MAC with 6 000 HP



Locomotive and traction control

The control system of the entire locomotive is based on microcomputer technology. It comprises a SIBAS® 16 traction control unit for each inverter and a locomotive control unit. This control unit processes the commands coming from the driver or trainlines to form the reference values for traction control.

Traction converter

The traction converter cabinet contains the following components:

- 6 GTO phase modules including gate drive units
- 12 MP capacitors (6 per DC link)
- 2 sets of current and voltage transformers
- 2 snubber resistors
- 1 fan
- 2 SIBAS® 16 traction control units

Each phase module contains the power semiconductors for one inverter phase (two GTO thyristors 4.5 kV/3.0 kA and two antiparallel diodes) as well as the snubber circuit diodes and capacitors. The GTO gate drive units are mounted outside on the module cover.

The heat losses of the electrical components arranged in the module are dissipated by evaporation bath cooling, a method long proven in rail vehicles.

The traction control units are housed in a separate compartment within the converter cabinet.

Doors and hatches provided in the cabinet affort easy and direct access to all components.

SIBAS® 16 traction control unit

The inverter for each truck is controlled by a traction control unit which contains the microcomputers, I/O modules as well as the necessary power supplies. The control unit performs such functions as traction control, wheelslip control, inverter protection and diagnostics. A data bus with RS485 compatibility is provided for a transmission of data between the traction control units and the locomotive control unit.

Traction motor 1TB2830

The four-pole squirrel-cage three-phase induction motor is designed specifically for use on locomotives with heavy axle loads.

The stator is of laminated frame construction with no housing. The lamination is held together by sturdy end plates and welded tie rods. The forced-ventilated motor is designed for axle-hung roller-bearing installation.

The stator winding is insulated according to insulation class H.

The traction motor is designed by Siemens AG and manufactured under license by General Motors of Canada Ltd. Diesel Division.

Starting torque	16 300 Nm 12 009 lbft
Continuous torque	12 900 Nm 9 504 lbft
Continuous rating	638 kW
Maximum voltage	2 183 V
Maximum speed	3 435 rpm

Siemens AG
Transportation Systems Group
Locomotives
P.O. Box 32 40
D-91050 Erlangen

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