

AC Induction Motor Drive

in Helsinki Metro Cars

0557-82 MND



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Oy Strömberg Ab has long had the thyristor-inverter controlled AC induction motor drive under intensive study and development. The traction motor drives of electric vehicles has been the primary objective. After successful prototype test runs it was possible in the beginning of 1974 to offer an AC induction motor drive to the Rapid Transit Office of the City of Helsinki for their new metro cars. In December 1974, after careful evaluation and comparisons, the Helsinki City decided to purchase six cars to be provided with the AC induction motor drive.

The initial order for six cars was followed by an order of an entire car series, i.e. 78 cars, in less than two years.

The metro cars ordered by the City of Helsinki have no doubt formed a basis for the further application of Strömberg AC induction motor drives, especially in light vehicles.

PURCHASER:

The Rapid Transit Office of the City of Helsinki, Finland

BODY AND BOGIES:

delivered by:

Metrovaunut Oy, owned by the Finnish companies Valmet Oy and Oy Strömberg Ab.

ELECTRICAL DRIVES:

Oy Strömberg Ab, Helsinki Works



Fig. 1. Central control unit, located on the back wall.

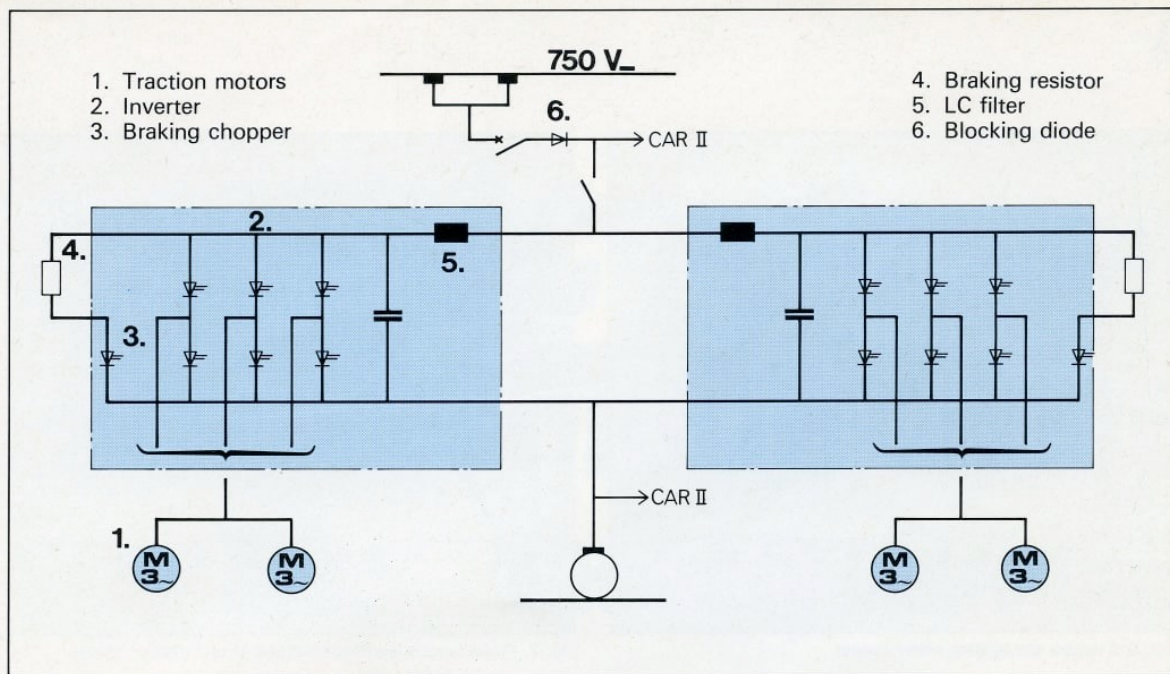
Main characteristics of a car

● weight, empty car	30 t
● length	21,5 m
● width	3,2 m
● gauge	1524 mm
● wheel diameter, half-worn wheels	800 mm
● maximum speed	90 km/h
● supply voltage	750 V d.c.
● continuous output	500 kW
● seating capacity	70
● total payload	15 t

Main circuit

The smallest functional unit is the two-car train. Both cars are provided with an identical traction motor drive. The car bogies have two traction motors in parallel supplied by a common inverter drive unit. Besides inverters, the inverter drive unit also contains LC filter

and braking chopper to enable electrodynamic braking. The diode connected after the main switch of the car prevents the energy supply back to the third track, and the braking energy is used for car heating.

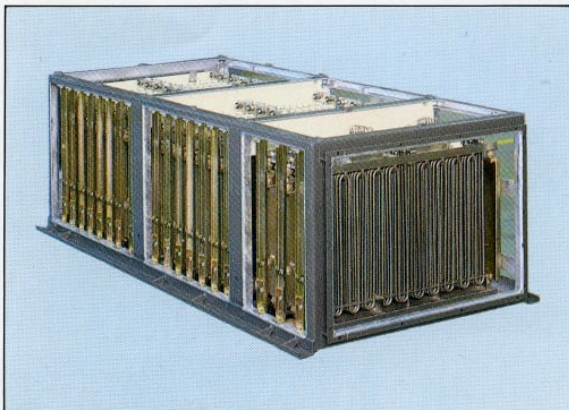
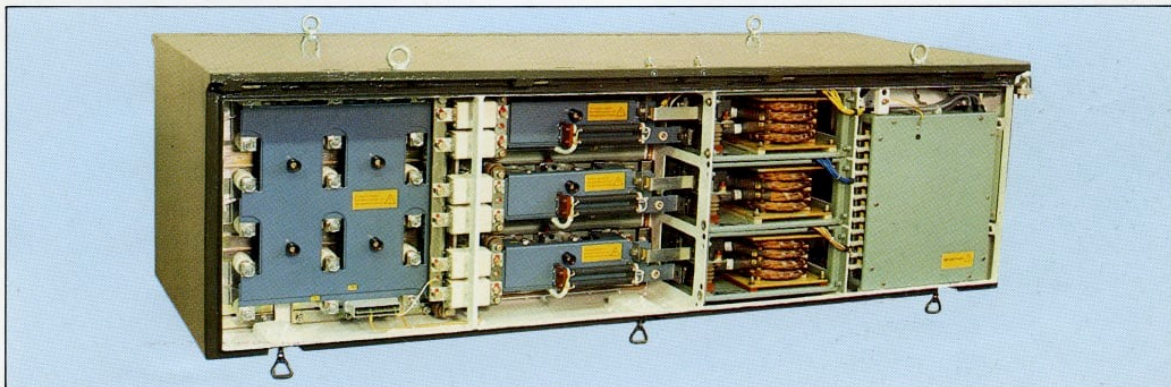


SYSTEM ENSURES:

- stepless drive control
- full electrodynamic braking down to zero speed
- powerful utilization of braking energy for car heating
- excellent spin and slide prevention characteristics
- low inertia in rotating parts

SYSTEM UTILIZES:

- totally enclosed traction motors
- completely solid state technique without moving parts
- pulse-width modulated inverter principle



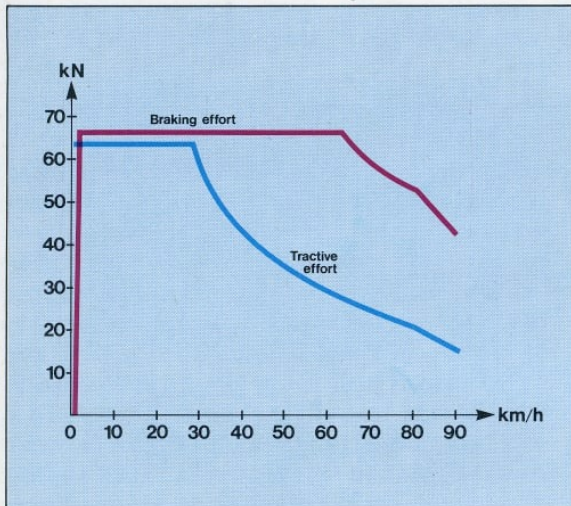


Fig. 6. Tractive and braking effort curves.

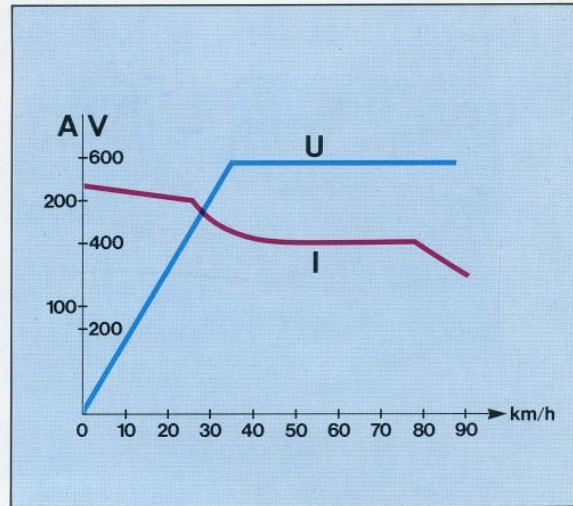


Fig. 7. Phase current and main voltage of one traction motor.

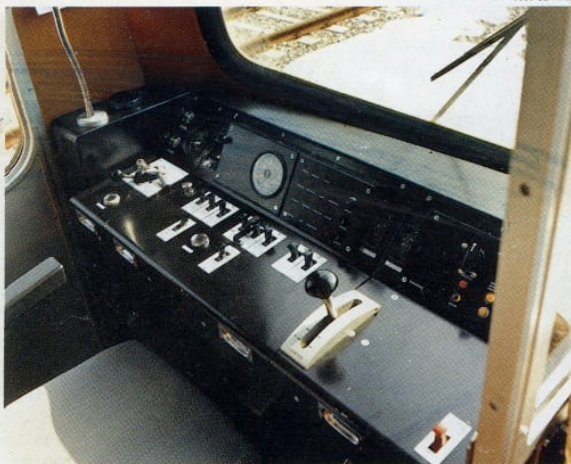


Fig. 8. Driver's cabinet.

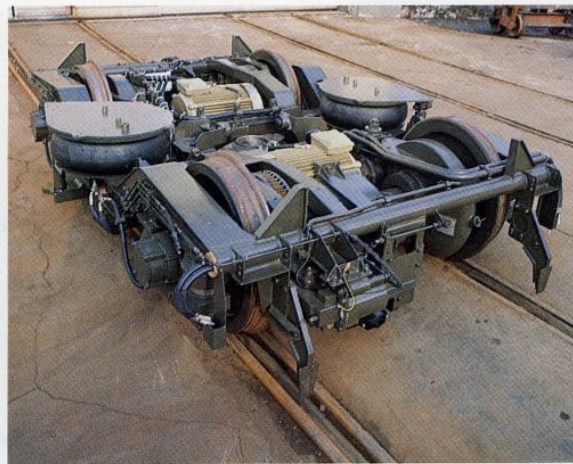


Fig. 9. Twin-motor bogie.

OUR SUBSIDIARIES:

United Kingdom
Stromberg (U.K.) Ltd.
P.O. Box 55
BASINGSTOKE
Hants RG 22 4EP
Telex: 858 449 strmb g
Telephone: (0256) 56 631

Norway
Strömberg-Thörnte A.S.
Postboks 6002 Etterstad
OSLO 6
Telex: 71 251 peget n
Telephone: (02) 688 680

Federal Republic of Germany
Strömberg Deutschland GmbH
Hermannstrasse 54/56
D-6078 NEU-ISENBURG
Telex: 4 185 672 sdg d
Telephone: (06102) 8035

Sweden
Strömberg Svenska Aktiebolag
Box 2036
S-145 02 NORSBORG
Telex: 11 536 str s
Telephone: (0753) 76 050

Argentina
Strömberg Argentina S.A.
San Martín 627-6° P.
1374 BUENOS AIRES
Telex: 21 321 effoa ar
Telephone: 393-8631, 8194,
8793, 8894

United States of America
Stromberg Inc.
Interstate Plaza
Suite 265
16 600 Sprague Road
Middleburg Heights
Ohio 44130
Telex: TWX 810-423-9435
att: Stromberg
Telephone: (216)-826-0607/08

Strömberg

Oy Strömberg Ab
P.O.B. 118, SF-00101 Helsinki 10, Finland
Tel. +358-0-550 045, telex 124 405 strp sf

Oy Strömberg Ab
P.O.B. 69, SF-65101 Vaasa 10, Finland
Tel. +358-61-158 222, telex 74211 strv sf

The technical data and dimensions are valid at the time of printing. We reserve the right to subsequent alterations.

REPRESENTATIVE OFFICE:

Soviet Union
A. Ahlström — Strömberg — Thomesto
Prospekt Marksa 14/1
Hotel National, 5th floor, room 377
Moscow
Telephone: 203-49-08
Telex: 413483 alsto su

PARTNERSHIP COMPANY:

Saudi Arabia
B.S.W.
(Binladen — Stromberg — Wartsila)
Electric Power Contracting Co. Ltd
P.O.B. 3143
Jeddah, Saudi Arabia
Telex: 403514 bsw sj
Telephone: 6719894, 6714053
Cable: Binsaxons, Jeddah