

7 Maintenance of Drive & Brakes

7.1 Drive – Q 409 447

1 General

The following subsections give an overview of these instructions. The details are covered by the attached instructions prepared by Renold Gears, unless otherwise noted.

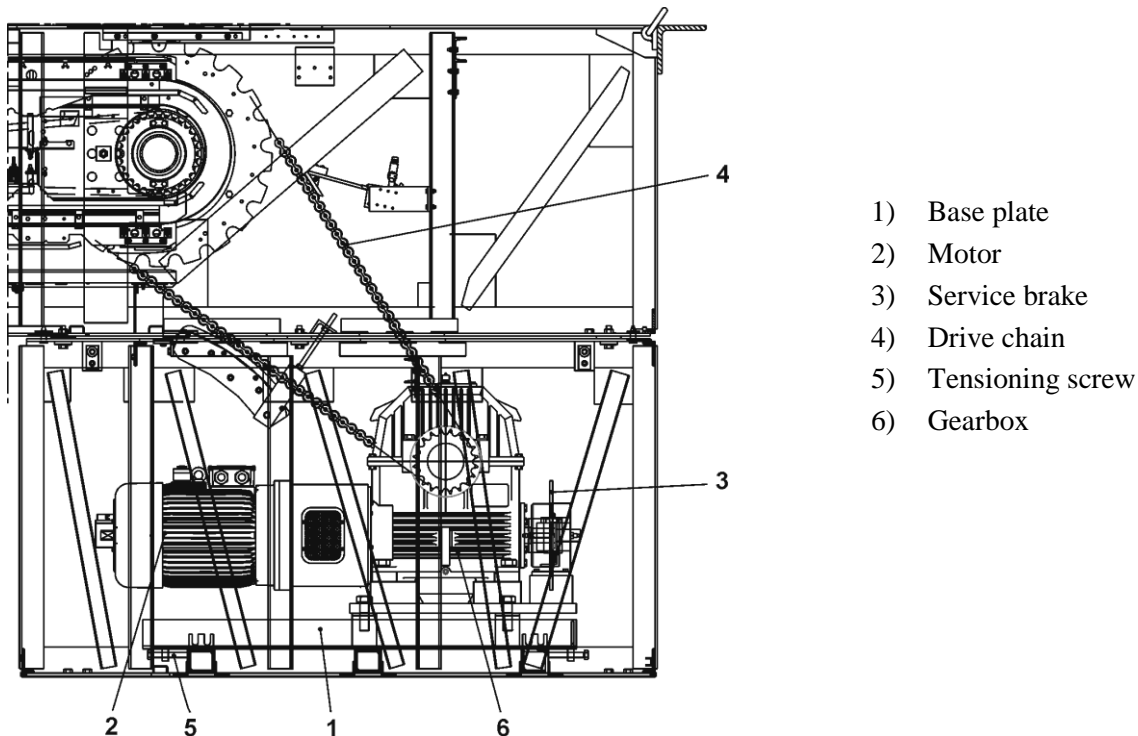


For more detailed information, see Volume VJ, Renold_O&M_Manual.pdf

2 Mode of Operation

2.1 Drive Unit

Fig. 447-01



- 1) Base plate
- 2) Motor
- 3) Service brake
- 4) Drive chain
- 5) Tensioning screw
- 6) Gearbox

The drive unit consists of an electric motor, a gearbox, a resilient coupling, the flywheel, the service brake, the main shaft, the safety brake and the main drive chain. The motor, the gearbox, the coupling, the flywheel and the service brake are mounted on a common base plate.

With Schindler 9700 escalators for WMATA, the drive is installed in the drive station in an additional cage beneath the upper section of the truss and is easily accessible.

2.2 Motor, Encoder and Vibration Sensor

The motor is suitable for inverter duty, CT 10:1, VT 10:1. Three sets of thermistors are installed, the wiring being terminated in the motor terminal box. The motor shaft has a special non-drive end (NDE) extension with a square end, and a modified motor cowl. The square end is to allow for manual rotation of the drive unit via a hand-winding ratchet, supplied loose with the drive unit package.

The motor is also equipped with a vibration sensor RVBM which is installed on top of the main drive motor. This vibration sensor is connected via the top junction box TJ respectively the bottom junction box BJ to the vibration diagnostics module VSE001. This module evaluates the sensor signals and indicates whether a preset vibration value for the corresponding sensor has been reached.



For more detailed information, see Controller Instructions J 595 009, MICONIC F PLC System Description, Section 1.2.2, Vibration Monitoring Module VSE001

2.3 Gearbox

The worm gear unit is fitted with an enhanced sealing arrangement on the worm line, as per arrangement drawings (see appendix), double oil seals fitted back to back on the wheel line, and a Filton breather to prevent ingress of atmospheric contaminants. The worm line enhanced sealing arrangement requires periodic relubrication via the grease nipples provided.

The worm shaft has extended diameters at both ends to accommodate a disk brake at the non-drive end and a motor coupling at the drive end. A fabricated motor adaptor supports a flange-mounted Nema motor, and houses the enhanced sealing cartridge at the drive end of the unit. A fan and cowl are fitted with the motor adaptor to provide ventilated cooling horizontally down the outside of the gear casing. Guards are provided to cover two cut-outs in the motor adaptor to prevent access to rotating parts.

Tapered roller bearings are fitted to both the worm shaft and the wheel shaft. The worm caps are shimmed to provide the required end float for the worm-shaft bearings. The wheel caps/covers are also shimmed to ensure correct gear contact and to prevent end float or preload on the wheel bearings.

The gear unit is also fitted with an inspection cover on the top of the gear casing which can be removed to inspect the gear contact.

A hollow shaft encoder ENC is mounted on the shaft extension. The input of this encoder is connected to the high-speed counter module DC541-CM and used for monitoring the motor speed during rated operation.

The measured motor speed is compared to the tolerance limits:

- Speed warning +5%: maximum of +5% above rated speed
- Speed warning -5%: maximum of -5% below rated speed
- Overspeed 15%: maximum of 15% above rated speed
- Overspeed 25%: maximum of 25% above rated speed
- Underspeed 20%: 20% below rated speed

With 25% overspeed, the safety brake engages in addition to the drive brake.

Error codes:

"E_18" for 15% overspeed

"E_CC" for 25% overspeed

"E_1C" for 20% underspeed



For more detailed information, see Controller Instructions J 595 009, MICONIC F PLC System Description, Section 1.1.1.3, Counter module DC541-CM

2.4 Drive Chain

A precision roller chain, which is used as a drive chain, transmits the drive torque from the gearbox to the escalator's main shaft, which is mounted at the upper end of the escalator in the drive station track block. The drive chain tension is maintained by moving the drive chain deflection device. A switch (**drive chain contact**) is provided to indicate loosening chain tension. When operated, the switch activates the escalator's emergency stop function.



For more detailed information, see Maintenance Instructions Q 409 452, Drive Chain, and Maintenance Instructions Q 409 453, Drive Chain Contact

2.5 Brakes

Schindler 9700 escalators for NYCT feature three independent brakes:

- The generously dimensioned, solenoid-released **service brake** is mounted outside the gearbox and acts via the brake disk directly on the worm shaft. The braking torque is independent of the direction of travel.

The brake engages in the case of normal and emergency stops (due to activation of one of the safety contacts), as well as in the case of power failures. In the case of normal stops (soft stops), the brake engages with a time delay. A brake contact prevents the motor from starting with the brake engaged. The controller monitors the "open" or "closed" position of this contact.

The brake can be manually released via a hand-winding device. This function is also monitored by a brake contact. A third contact is provided for monitoring the wear of the brake pad.

- The **safety brake** (disk brake) is mounted on the end of the main shaft and, if necessary, only acts during downward travel. It is always installed in tandem with the drive chain contact.

The brake disk which is provided with brake pads is pressed against the surface of the drive chain sprocket by means of a pressure disk. Retainer blocks on the brake disk engage with a pawl which stops the rotation of the disk.

In the case of normal stops or stops caused by safety devices not listed below, the pawl engages simultaneously with the service brake in the upward direction of travel and with a time delay of approx. 3 seconds in the downward direction of travel.

The pawl engages without delay in the following cases:

- breakage or excessive elongation of the drive chain
- 25% overspeed

and with a time delay in the case of power failure.



For more detailed information, see Maintenance Instructions Q 409 710, Safety Brake

3 Related Faults and Troubleshooting

The following troubleshooting routines are associated with the drive, the drive brake system and the encoder:

Fault Code	Description	Troubleshooting
18-ENC-15% Motor Overspeed	Defective encoder System not configured properly	Check the actual speed of the motor. With the motor overspeeding, contact the factory.
1C-ENC_MU-15% Motor Underspeed	Defective encoder System not configured properly	Check the actual speed of the motor. With the motor overspeeding, contact the factory.
24-WTHM_TR-Motor	Motor windings are overheated	If the motor is overheated, consider what may be the cause, e.g., frequent start-ups during maintenance, loss of one phase or defective motor windings.
	PTC thermistor or wiring is defective	If the motor feels warm from outside, wait until it has cooled down. If the fault persists, check the PTC thermistor by measuring the resistivity with an ohmmeter. Under normal conditions, the reading should not exceed 400 Ohms. If the PTC does not show any faults, check the wiring according to the schematics.
	PTC module is defective	If none of the above measures can solve the problem, replace the module.
26-ENC-Rotation	Two motor phases are swapped	Check the motor direction in maintenance mode and correct the phase sequence accordingly.
	Drive chain too tight	This extra stress on the drive chain suffices to force the escalator into the other direction when the unit is restarted and the service brake is released. Adjust the drive chain according to the instructions given in the manual.
38-ENC_FLT-Encoder Failure	Encoder or high-speed counter module is defective	Check whether the PLC displays the fault code "E_38". In this case, the HSC module is defective. Replace the module.
		Start the unit if no signal is received on the HSC module and wiring is correct. Then, check the encoder and replace it, if necessary.
	Loose wiring	Check and correct any wiring problems according to the schematics.
43-KOMH_TR-Gear Oil Level	Gear oil level too low	Check the oil level and add oil, if necessary.
	Oil level gage switch defective	Refer to the manufacturer's manual.

Fault Code	Description	Troubleshooting
70-KB1-Service Brake Release Fault Mntr	Switch not working properly	Check the switch's adjustment and functionality. Adjust or replace the switch, if necessary.
	Service brake does not engage	Faulty brake system. Refer to the manufacturer's manual for further information.
73-KBMR1-Service Brake Manual Release	Service brake is manually released	Reset the brake back to its normal position. Refer to the manufacturer's instructions.
	Switch not working properly	Check the switch's adjustment and functionality. Adjust or replace the switch, if necessary.
	Service brake manual release does not reset	Faulty brake system. Refer to the manufacturer's manual for further information.
76-KGRDM-Mtr Shaft Cover Removed	The shaft cover is removed or not installed properly	Place the shaft cover in its proper position.
	Defective switch	Check the switch's adjustment and functionality. Adjust or replace the switch, if necessary.
CC-ENC_MO-25% Motor Overspeed	Defective encoder System not configured properly	Check the actual speed of the motor. With the motor overspeeding, contact the factory.
D9-KBB1-Service brake Pad Mntr	Brake pads worn out	Replace the brake pads.
	Switch not properly adjusted	Adjust the switch according to the manufacturer's instructions.
DD-DHMH-Drive Machine E-STOP	E-stop is engaged	Pull and reset the drive machine e-stop.
EA-ENC_D-Braking Dist. Exceeded	Service brake not working properly	Check and correct the brake's functionality. Adjustment may be needed. Refer to the manufacturer's manual.
F7-RGBA-RGBA	Safety brake solenoid is defective	Replace the solenoid.
	Safety brake not adjusted properly	Visually inspect the solenoid's behavior during the brake function test and determine which adjustments are necessary.
	Control relays defective	Replace the relays.