

TEST REPORT · ZhP TRAKTSIA LOKOMOTIVI — SOFIA, BDZ EAD

EL 44 075.0 traction gearbox: the teeth gained metal, the control one kept wearing

ZhP Traktsia Lokomotivi — Sofia, BDZ EAD · signed by: Eng. V. Todorov, Eng. R. Lukanov, Eng. S. Nikolova · treatment by XADO technology carried out by MAY OOD — A. Iliev, V. Dzhondzhorova
Sofia, Bulgaria · treatment 24.01.2003 · control measurements 01.07.2003

PRODUCT

Treatment
by XADO technology

one traction motor gearbox was
treated, the second gearbox of
the same locomotive was left as
the control

TEST OBJECT

EL 44 electric locomotive
No. 075.0

BDZ EAD · traction motor
gearboxes, wheelsets 20958 X
76 951 and 34051 XI 79 1237

DOCUMENT TYPE

Commission report
with five signatures

MACHINE AND UNIT**SERVICE DURING
THE TEST****WHAT WAS MEASURED**

EL 44 electric locomotive No.
075.0, traction motor gearbox —
experimental, wheelset 20958 X 76
951

**63 314 km · 158
days**

Thickness of five marked teeth of the large
gear at three points, with two tooth calipers;
thickness of five teeth of the small gear

Same locomotive, traction motor
gearbox — control, wheelset 34051
XI 79 1237, not treated

**63 314 km · 158
days**

Thickness of the small gear teeth, the same
measuring points

The test was ordered by instruction 27-00-V-28 of 15.01.2003 issued by the Central Administration of BDZ EAD; the measurements were made at ZhP Traktsia Lokomotivi — Sofia. The oil of the treated gearbox was neither changed nor topped up over the 63 314 km.

Key results

↑ **0.47 mm**

small gear tooth thickness, average;
deviation from nominal 0.50-0.57 →
0.00-0.03 mm

↑ **0.20 mm**

large gear tooth thickness, average;
deviation from nominal 0.70-1.11 →
0.60-0.95 mm

↓ **0.20 mm**

small gear of the untreated gearbox
over the same 63 314 km, deviation
0.25-0.32 → 0.40-0.55 mm

Treated gearbox — large gear wheel, tangential tooth caliper

TOOTH	READING AT 30 MM	READING AT 60 MM	READING AT 80 MM
1	-1.0 → -0.70	-1.03 → -0.90	-1.06 → -0.80
2	-1.01 → -0.95	-1.05 → -0.90	-1.10 → -0.91
3	-1.0 → -0.82	-0.99 → -0.80	-0.95 → -0.80
4	-0.70 → -0.65	-1.06 → -0.80	-0.90 → -0.60
5	-1.11 → -0.80	-1.10 → -0.92	-1.05 → -0.90

Deviation of tooth thickness from nominal, in millimetres: before treatment → after **63 314 km** of running. Five pre-marked teeth were measured, each at three points; the control readings were taken on the same teeth. Thickness increased at all fifteen points, growth **0.05-0.31 mm**.

The same gear wheel, second caliper — standard type

TOOTH	READING AT 30 MM	READING AT 60 MM	READING AT 80 MM
1	16.60 → 16.90	16.50 → 16.66	16.48 → 16.72
2	16.50 → 16.68	16.52 → 16.62	16.52 → 16.70
3	16.42 → 16.60	16.55 → 16.70	16.55 → 16.69
4	16.48 → 16.60	16.60 → 16.65	16.55 → 16.72
5	16.55 → 16.65	16.55 → 16.68	16.55 → 16.64

Tooth thickness in millimetres. The same teeth and the same points were measured with a second caliper: growth **0.05-0.30 mm**, an increase at all fifteen points. Two different instruments give one and the same result for the treated gearbox.

Treated gearbox — small gear wheel

TOOTH	DEVIATION BEFORE TREATMENT	DEVIATION AFTER 63 314 KM	THICKNESS CHANGE
1	−0.57 mm	0.00 mm	+0.57 mm
2	−0.53 mm	+0.03 mm	+0.56 mm
3	−0.50 mm	+0.03 mm	+0.53 mm
4	−0.50 mm	+0.03 mm	+0.53 mm
5	−0.50 mm	+0.03 mm	+0.53 mm

Measured at mid-tooth, deviation from nominal. All five teeth reached nominal thickness: four exceeded it by **0.03 mm**, the fifth came out exactly at nominal.

Control gearbox of the same locomotive — small gear wheel

TOOTH	DEVIATION AT THE START	DEVIATION AFTER 63 314 KM	THICKNESS CHANGE
1	−0.30 mm	−0.40 mm	−0.10 mm
2	−0.25 mm	−0.50 mm	−0.25 mm
3	−0.32 mm	−0.55 mm	−0.23 mm
4	−0.32 mm	−0.55 mm	−0.23 mm

This gearbox was not treated and covered the same **63 314 km** on the same locomotive, under the same conditions. Before the test it was less worn than the treated one, therefore the absolute thicknesses of the two gearboxes are not compared with each other: every tooth is compared with itself.

Conclusions of the report

Both gearboxes ran the same **63 314 km** on one locomotive and under identical conditions; the oil of the treated gearbox was neither changed nor topped up over the whole run. The commission of ZhP Traktsia Lokomotivi — Sofia recorded in the section "Izvodi" (Conclusions):

1. The teeth of the large gear of the experimental gearbox grew on average by **0.20 mm**.
2. The teeth of the small gear of the experimental gearbox grew on average by **0.47 mm**.
3. On the teeth of the large gear of the control gearbox slight wear was noted — up to **0.02 mm**.
4. On the teeth of the small gear of the control gearbox wear of up to **0.2 mm** was noted.
5. On the teeth of the large gear of the experimental gearbox the healing of existing pittings is observed, except for those outside the contact zone.



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The results refer to the traction motor gearbox of EL 44 electric locomotive No. 075.0 at a run of 63 314 km; on other units and under other operating modes the figures may differ. The treatment was carried out by MAY OOD — a XADO distributor; the measurements and their certification — by the commission of ZhP Traktsia Lokomotivi, Sofia. The report is published in full and available for download.