



ACT OF COMPLETED RESTORATION WORK

FPEM milling machine: ball screw backlash back in tolerance, teardown repair cancelled

Kharkiv State Aircraft Manufacturing Company (KhGAPP) · control measurements: mechanic of building 45 O. V. Kramarev · signed by: deputy chief mechanic of KhGAPP V. A. Trushchev, technical director of XADO LLC S. N. Aleksandrov
Kharkiv, Ukraine · treatment 27.07.2000 · repeat control measurement 11.09.2000

PRODUCT	TREATED UNIT	DOCUMENT TYPE
XADO compound applied while the machine stayed in regular production, without taking it out for repair	Ball screw of the table drive FPEM milling machine, inv. no. 4826 · X axis	Bilateral act of KhGAPP and XADO LLC, signatures and stamps

EQUIPMENT	CONDITION AT THE START OF WORK	WHAT WAS MEASURED
FPEM milling machine, inv. no. 4826	Table drive ball screw backlash 0.12-0.21 mm — above the manufacturer's tolerance at every measuring point	Ball screw backlash along the X axis: at the table edges and at the table centre
Repair that had been planned	Disassembly of the ball screw, grinding of the spacer washer, replacement of the balls	The treatment was carried out instead of this repair, on the running machine

Control measurements were taken by the mechanic of building 45 of KhGAPP with a dial indicator.

Key result

↓ **4.2×**

ball screw backlash at the table centre after 46 days in service, 0.21 → 0.05 mm

Backlash of the table drive ball screw, X axis

MEASURING POINT	BEFORE TREATMENT	AFTER 2 H OF TABLE RUN-IN	AFTER 46 DAYS IN SERVICE
At the table edges	0.12-0.14 mm	0.0 mm	0.07-0.06 mm
At the table centre	0.21 mm	0.03 mm	0.05 mm

The manufacturer's tolerance stated in the act is 0.08 mm: before the treatment every measuring point was above it, after the treatment and after 46 days of service — below it.

Economic effect according to the act

OPERATION OF THE SCHEDULED REPAIR	STATUS AFTER TREATMENT
Disassembly of the ball screw	Eliminated
Grinding of the spacer washer	Eliminated
Replacement of the balls	Eliminated
Equipment downtime for the repair	Reduced

The list is taken from the "Economic effect" section of the act. The compound was applied with partial disassembly of the ball screw nut, without taking the machine out for repair.

Conclusion of the act

The machine was being prepared for a repair involving disassembly of the ball screw, grinding of the spacer washer and replacement of the balls: backlash along the X axis exceeded the manufacturer's tolerance at every measuring point, and at the table centre by **2.6×**. The compound was applied while the machine stayed in regular production. Already after **2 hours** of table run-in the backlash at the centre dropped from **0.21** to **0.03 mm**, and at the edges it was taken up completely; a repeat measurement after **46 days** of service showed **0.05 mm** — still below the factory tolerance of **0.08 mm**. Conclusion of the act: "This experiment demonstrates the possibility of full restoration of the operating characteristics (manufacturer's tolerances 0.08 mm). The restoration of the ball screw confirms the warranty obligations of the XADO company and demonstrates the need for wider adoption of XADO technology® at KhGAPP".



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The results refer to the ball screw of the table drive of the FPEM milling machine and to its operating conditions at KhGAPP; on other equipment the figures may differ. The act is bilateral: the treatment was carried out by XADO LLC, the control measurements by a KhGAPP mechanic. The original act of 11.09.2000 with signatures and stamps is published in full and available for download.