

TREATMENT OCTOBER 2007 — JANUARY 2008 · REPORTS JANUARY–FEBRUARY 2008

# Spindles 3U131V and BHU-25: vibration and current down, grinding accuracy up

AVIASTAR-SP JSC, Ulyanovsk · plant commission: deputy chief mechanic, department No. 162, shop No. 170, with the participation of XADO LLC

Ulyanovsk, Russia · treatment cycle October 2007 — January 2008 · four reports, signatures and plant seal

**PRODUCT**

XADO revitalizant  
compounds

treatment of the spindle  
lubrication system without  
stopping for repair and without  
disassembling the unit

**TEST OBJECT**

Spindle units of four  
cylindrical grinding  
machines

3U131V ser. No. 22 and No. 58 ·  
BHU-25 ser. No. 178604 and  
No. 178610 · plain bearings

**DOCUMENT TYPE**

Four technical reports  
of AVIASTAR-SP JSC

approved by the Director for  
ETOS and R, certified with the  
plant seal

| MACHINE                    | SER. No. | SPINDLE AT MEASUREMENT | RUN TIME AFTER TREATMENT | WHAT WAS MEASURED                                            |
|----------------------------|----------|------------------------|--------------------------|--------------------------------------------------------------|
| Cylindrical grinder 3U131V | 22       | 1285 rpm               | 482 h                    | current and power, spindle and bed vibration, part roundness |
| Cylindrical grinder 3U131V | 58       | 1285 rpm               | 457 h                    | current and power, spindle and bed vibration, part roundness |
| Cylindrical grinder BHU-25 | 178604   | 1450 rpm               | 245 h                    | current and power, spindle and bed vibration, part roundness |
| Cylindrical grinder BHU-25 | 178610   | 1450 rpm               | 325 h                    | current and power, spindle and bed vibration, part roundness |

Machines in current plant service. Measurements were taken before treatment and repeated after the full cycle and the stated run time under normal operation.

## What repeated on all four machines

↓ **7-15 %**

current draw per phase, 5.2-7.9 → 4.5-6.8 A

↓ **48-72 %**

vibration velocity at the spindle bearings and bed, 0.4-2.9 → 0.2-1.4 mm/s

↓ **2-5×**

roundness deviation of the test part, 0.004-0.01 → 0.002 mm

## Power consumption of the spindle drive at idle

| MACHINE, SER. No.       | CURRENT BEFORE, A | CURRENT AFTER, A | CURRENT REDUCTION | POWER REDUCTION PER REPORT CONCLUSIONS |
|-------------------------|-------------------|------------------|-------------------|----------------------------------------|
| 3U131V, ser. No. 22     | 7.4-7.9           | 6.7-6.8          | 9-14 %            | 22-26 %                                |
| 3U131V, ser. No. 58     | 5.2-5.3           | 4.8-4.9          | 7-9 %             | 22-27 %                                |
| BHU-25, ser. No. 178604 | 5.37-5.42         | 4.6-4.8          | 11-15 %           | 22-27 %                                |
| BHU-25, ser. No. 178610 | 5.2-5.3           | 4.5-4.7          | 9-15 %            | 18-22 %                                |

Current and power over three phases, ATK2200 multimeter, idle running. Power is given per the report conclusions; per-phase measurements on BHU-25 give 21-31 %.

## Vibration of the spindle bearing units and the bed

| MACHINE, SER. No.       | MEASURING POINTS | VIBRATION VELOCITY BEFORE, mm/s | AFTER, mm/s | TYPICAL REDUCTION |
|-------------------------|------------------|---------------------------------|-------------|-------------------|
| 3U131V, ser. No. 22     | 15               | 0.52-2.89                       | 0.29-1.13   | 22-75 %           |
| 3U131V, ser. No. 58     | 15               | 0.44-1.48                       | 0.27-1.41   | 17-59 %           |
| BHU-25, ser. No. 178604 | 15               | 0.69-1.72                       | 0.23-0.58   | 58-72 %           |
| BHU-25, ser. No. 178610 | 16               | 0.86-2.84                       | 0.23-1.15   | 57-75 %           |

SENDIG 911 vibrometer; points on the front and rear spindle bearings and on the bed, idle running and grinding. At the strongest points the reduction reaches 80-84 %.

# Machine accuracy measured on a test part

| MACHINE, SER. No.       | ROUNDNESS DEVIATION BEFORE, mm | AFTER, mm |
|-------------------------|--------------------------------|-----------|
| 3U131V, ser. No. 22     | 0.004                          | 0.002     |
| 3U131V, ser. No. 58     | 0.004                          | 0.002     |
| BHU-25, ser. No. 178604 | 0.01                           | 0.002     |
| BHU-25, ser. No. 178610 | 0.004                          | 0.002     |

Roundness tester mod. 290, in-house measuring laboratory of AVIASTAR-SP JSC. The item measured was a pin ground on the same machine before and after treatment.

## Finding of the plant commission

On all four machines the commission of AVIASTAR-SP JSC recorded the same picture: lower current and power consumption at idle, a lower vibration level of the spindle bearing units and the bed, and a **2.0×** smaller roundness deviation of the test part. The reports name the mechanism directly: "The reduction in power consumption became possible owing to the lower friction coefficient in the plain bearings", and the gain in accuracy — "owing to optimisation of thermal clearances in the spindle unit bearings by means of a metal-ceramic layer". The outcome: the treatment "made it possible to substantially raise its accuracy and extend the machine service life by no less than **2.0×** without stopping for repair or disassembly", and the improved parameters allow more precise operations to be performed on these machines. On machine ser. No. 178610, bearing repairs were carried out in the same period, and the report attributes the result not to the treatment alone.

**XADO**

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The results relate to the spindle units of 3U131V and BHU-25 cylindrical grinding machines with plain bearings treated at AVIASTAR-SP JSC in 2007–2008; on other equipment and under other operating conditions the figures may differ. The originals of all four reports with signatures and seals are published in full and available for download.