



SKF Spindle Assessment Kit

Quick start user guide



The Power of Knowledge Engineering



SKF Spindle Assessment quick start user guide

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Introduction - SKF Spindle Assessment Kit

This quick start user guide provides an overview of how to use the SKF Spindle Assessment Kit to inspect and assess your machine tool spindles.

The services covered in this guide are primarily intended to be performed as part of regular spindle assessments, but can also be used as one-time spindle condition checks.

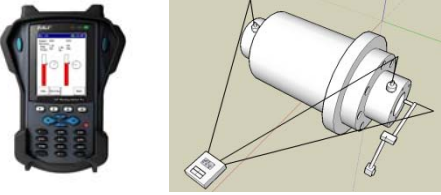
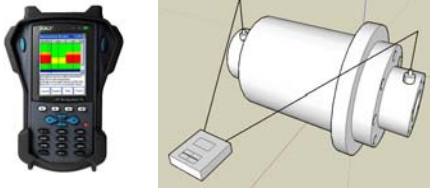
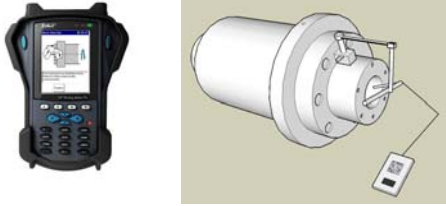
Although most activities in this kit are derived from competencies within our SKF Spindle Service Centers, the services in this guide can be performed by any personnel with adequate competence and training.

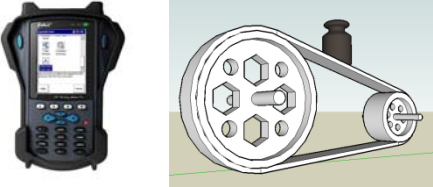
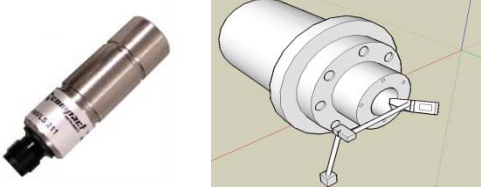
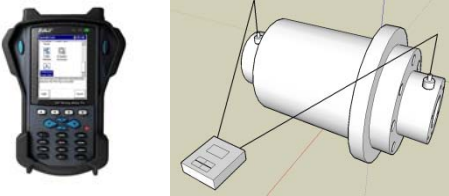
We hope this quick guide will help you get the most when using the SKF Spindle Assessment Kit.

However, please also consult the SKF Microlog User Manual for detailed use of the SKF Microlog.

Should you require additional training, have a need for further Spindle Service or PdM support, or if you have any comments or questions, please contact your closest SKF office or distributor.

Overview - SKF Spindle Assessment Kit

<p>Imbalance & Balancing</p> <p>Benefits</p> <ul style="list-style-type: none"> - Improve work piece surface finish and increase cutting tool life - Prolong spindle life and therefore reduce maintenance costs and downtime - Reduce structural load on machine - Reduce workshop noise 	<p>Method</p> <p>While your spindle is still in the Machine Tool (M/T), measure the imbalance condition using the SKF Microlog and accelerometer sensors. When applicable, trim balance using the SKF Microlog.</p> 
<p>Bearing condition & Mechanical condition</p> <p>Benefits</p> <ul style="list-style-type: none"> - On the spot assessment identifies potential problems - Identify indications of relative deterioration - Avoid breakdowns and secondary damages - Exclude non-spindle related problems and avoid unnecessary spindle repairs 	<p>Method</p> <p>Measure bearing vibrations (Vel/Acc & Env) with SKF Microlog and automatically evaluate against SKF vibration acceptance standard for machine tool spindles.</p> 
<p>Tool nose run-out, EM distance & Clamp force</p> <p>Benefits</p> <ul style="list-style-type: none"> - Improve safety, and help avoid personal injuries - Avoid accidental damage to M/T, spindle and tool holders - Reduce tendency for vibration and therefore improve cutting tool life and product surface finish - Improve stiffness and, as a result, improve precision capability and product quality - Avoid expensive and time consuming tool nose restoration - Improve M/T availability by short restoration downtime 	<p>Method</p> <p>Using visual inspection and a range of special precision control tools, identify actual tool holder pull force and nose run-out measures.</p> 

<p>Belt tension</p> <p>Benefits</p> <ul style="list-style-type: none"> - Avoid overloading of spindle bearings and therefore avoid breakdown and secondary damages - Reduce belt fatigue condition and extend belt life to avoid breakdowns - Reduce noise 	<p>Method</p> <p>Inspect wear and tear of belts. Measure tension with use of frequency gauge. Compare to comparable practices for corresponding belt type and application.</p> 
<p>Speed accuracy</p> <p>Benefits</p> <ul style="list-style-type: none"> - Improve tool life and output by ensuring correct applied cutting data - Improve product quality (e.g. thread machining) 	<p>Method</p> <p>By use of an externally applied tachometer, the actual speed (rpm) is compared to a predefined programmed speed value.</p> 
<p>Resonance frequency</p> <p>Benefits</p> <ul style="list-style-type: none"> - Minimize uncontrollable product surface finish and unstable cutting tool life - Prolong spindle life and thus reduce maintenance costs and downtime - Reduce structural load on the M/T - Noise reduction 	<p>Method</p> <p>By performing a Run-Up/Coast Down sequence while monitoring vibration behaviour with the SKF Microlog, resonance speed domains (rpm/frequency) will be identified.</p> 

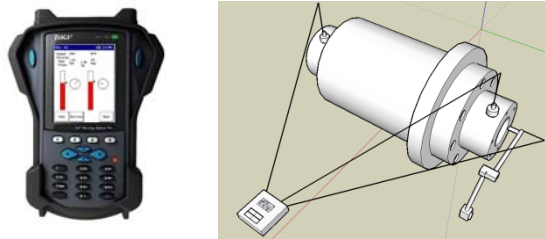
Imbalance & Balancing

Benefits

- Improve work piece surface finish and increase cutting tool life.
- Prolong spindle life and thus reduce maintenance costs and downtime.
- Reduce structural load on machine.
- Reduce workshop noise.

Method

While your spindle is still in the machine tool, measure imbalance condition with the SKF Microlog and accelerometer sensors. If imbalance is present, trim balance using the SKF Microlog (balancing module) and suitable balancing weights (screw, clay).



Instructions

Imbalance

1. Install a balanced master tool in the spindle nose.
2. Run the spindle slowly to working temperature. Then, increase speed step-by-step until maximum speed is reached.
3. Mount the magnetic vibration sensors on the spindle house (non-rotating part), close to the bearings. Note the angular position of the sensors with , for example, a photo or sketch.
4. Perform a Run-Up / Coast Down with the SKF Microlog and identify the dominant resonance frequencies. Key in value into the SKF Microlog.
5. Restart the spindle and increase speed to approximately 80% of maximum speed (or typical operating speed as advised by machine tool user). Be sure that any resonant frequencies are avoided.
6. Execute a vibration measurement (Vel/Acc & Env – mechanical & bearing condition). Do the automatic evaluation against SKF vibration acceptance standard for machine tool spindles.
7. If the imbalance values (Vel) exceeds limits, proceed with balancing.

SKF Machine Tool Precision Services

Balancing

1. Mount the magnetic vibration sensors on the spindle house (non-rotating part), close to the bearings.
2. Mount and connect the tachometer to a non-rotating part of the spindle or close to the spindle.
3. Measure (Vel) at various sensor positions to determine highest radial angular position. Note the final angular position of the sensors with, for example, a photo or sketch.
4. Start spindle to recommended 80% of the max frequency (or typical operating speed as advised by machine tool user). Be sure that any resonant frequencies are avoided.
5. Perform balancing in front and rear if possible.
6. Repeat until balancing is completed, which is indicated by a green light on the SKF Microlog

Required equipment

- SKF Microlog
- 2 x acceleration sensor
- Weight scale + weights (0,1 g)
- Tachometer + reflex tap
- Master tool holder (symmetric and perfectly balanced)

Note

Balancing is only possible on spindles where external balancing is possible.

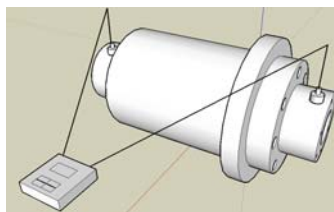
Bearing condition & Mechanical condition

Benefits

- On the spot check will indicate any potential problems.
- Indications of relative deterioration.
- Minimize breakdowns and secondary damages.
- Exclude non-spindle related problems and therefore avoid unnecessary spindle repairs.

Method

Measure bearing and mechanical vibrations (Vel/Acc & Env) using SKF Microlog and evaluate against SKF vibration acceptance standard for machine tool spindles.



Instructions

1. Install a balanced “master tool” in the spindle nose. Run the spindle slowly to working temperature, increase speed step-by-step until maximum speed is reached.
2. Apply the vibration sensors on a suitable place at the spindle, close to the bearings. Note angular position with, for example, a photo or sketch.
3. Restart the spindle and increase the speed to approx 80% of maximum speed (or typical operating speed as advised by machine tool user). Check to avoid any resonant frequencies.
4. Execute vibration measuring (Vel/Acc & Env – mechanical & bearing condition).
5. Measured vibration values are automatically compared against SKF vibration acceptance standards for machine tool spindles. Any non-conformance will be highlighted.
6. If required, perform full spectrum analysis.

Required equipment

- SKF Microlog
- 1 x acceleration sensor
- Thermometer

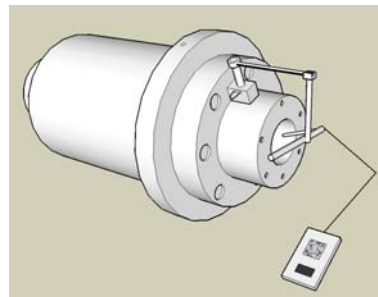
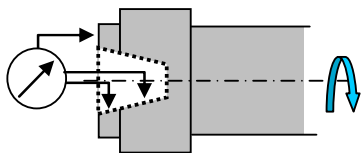
Tool nose run-out

Benefits

- Avoid M/T, spindle and tool holder damage.
- Reduce tendency for vibration and therefore improve cutting tool life and product surface finish.
- Identify when tool nose restoration is required.

Method

By use of Indicator, measure run-out of tool nose during slow manual rotation.



SKF Machine Tool Precision Services

Instructions

1. Clean all tool nose surfaces, inside and outside.
2. If any scratches are found, polish with a lapping film 30 μ , 12 μ alt. 5 μ to erase high peaks. Afterwards, clean with liquid.
3. Verify tool holder type, ISO or HSK, and tool holder size.
4. Place indicator \sim 1/4 from bottom of the taper and \sim 1/4 from the face of the taper.
5. Manually rotate the shaft slowly (in the two positions) and read the total run-out.
6. Key-in values in the SKF Microlog.
7. HSK & Big plus nose types: After completing the radial measuring, follow up with axial measuring (contact face).
8. Identify the run-out values and automatically evaluate against SKF run-out acceptance standard.

Required equipment

- SKF Microlog
- Magnetic foot with adjustable arm
- Indicator (μ m)

EM distance & Clamp force

Benefits

- Help avoid personal injuries.
- Help avoid M/T, spindle and tool holder damages.
- Reduce tendency for vibration to improve cutting tool life and product surface finish.
- Improve stiffness and thus improve precision capability and product quality.
- Avoid expensive and time consuming tool nose restoration.

Method

By use of depth micrometer and special clamp force gauge, identify EM distance and actual drawbar pull force.

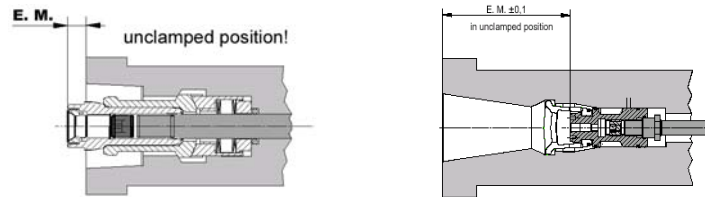


Instructions

EM distance

1. Verify tool holder type, ISO or HSK, and tool holder size.
2. Extract the tool holder extruder to end position and measure with a depth micrometer against the shaft face. Key in the value in the SKF Microlog.
3. Evaluate automatically the EM distance value against acceptance standard.

4. Perform corrective actions if needed.



Clamp force

1. Visually inspect for worn shaft taper and fingers, missing fingers and lack of lubrication.
2. Mount the correct adapter and knob (stud) on the pull force gage, measure the pull force.
3. Repeat pull force measuring five times and calculate the average value. Key in average value in the SKF Microlog.
4. Identify drawbar pull force and automatically evaluate against acceptance standard.
5. If result does not meet the standard, identify the root cause, such as: Finger defects, inadequate grease, broken or weak washer springs.

Required equipment

- SKF Microlog
- Tool pull force gauge set (ISO 30, 40, 50 & HSK 40, 63, 100)
- Depth micrometer