SKF Grease Test Kit TKGT 1

Instructions for use

Table of contents

Original instructions

Original instructions

Safety recommendations

- Always read and follow the operating instructions.
- Do not expose to high humidity, temperature exceeding 40 °C (105 °F) or direct contact with water.
- Read single components instructions for use provided in appendixes (Microscope).
- Read greases safety data sheets.
- Obey local regulations regarding handling of lubricants.
- Do not use the kit while food or drinks are standing around.
- Comply with machinery and local safety recommendations before sampling.
- Use provided nitrile, powder free disposable gloves to avoid direct skin exposure with grease. Long term contact with greases may cause skin allergic reactions.

1. Introduction

Grease is used to lubricate around 80% of all rolling element bearings. Poor lubrication methods account for around 50% of all premature bearing failures. Poor lubrication methods include such things as:

- wrong lubricant selection
- wrong amount of lubricant (over and under greasing)
- wrong lubrication delivery (ingress of contaminants)
- and wrong lubrication intervals.

Monitoring grease condition in the field allows decisions to be made quickly. A quick diagnosis of the grease condition can make a real difference to the bearing condition and performance.
The SKF Grease Test Kit TKGT 1 has been especially designed to be used in the field and offers a complete fast testing method. No special training is required and the tests themselves are easy to perform. Compared to most laboratory type tests, the sample of grease required for an analysis is very small (typically just 0,5 grams), allowing the tests to be conducted on most sizes of bearings.
To further simplify procedures and safety, no harmful chemicals are required for any of the testing methods.

Monitoring grease condition is very important. By being proactive, actions can be taken before the lubrication contributes to deterioration of machinery condition such as an increase in bearing temperature or vibration levels.
Monitoring grease condition gives valuable information on the application condition.

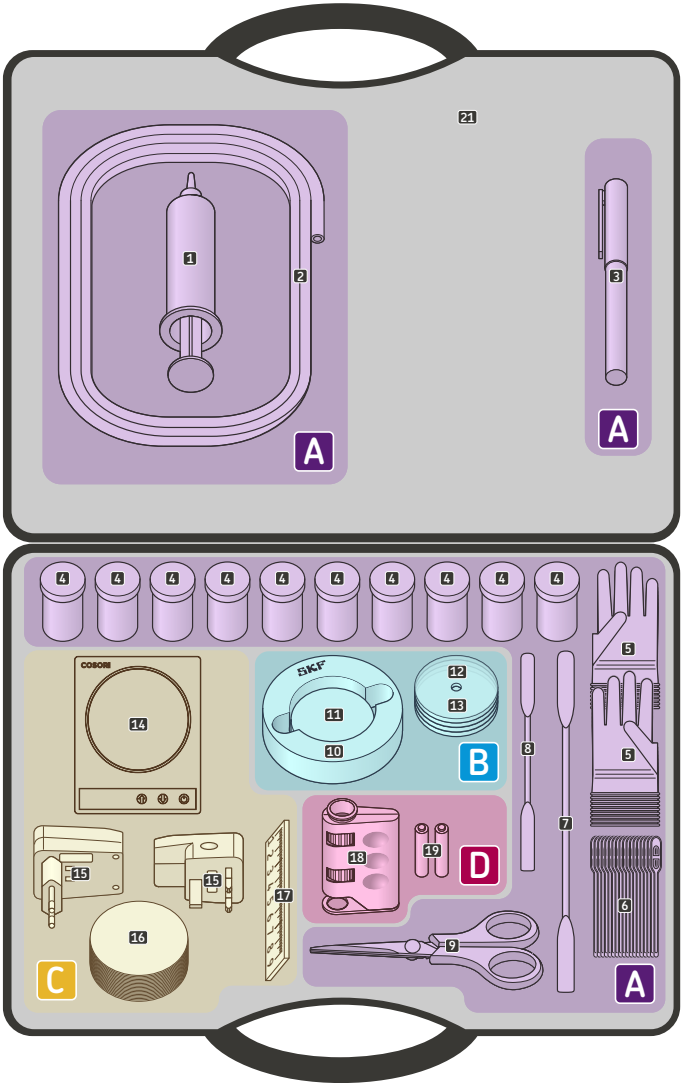
Changes in grease properties can be monitored and can help evaluating: grease shelf life, grease quality, grease performance, trending to determine best re-lubrication interval and colour changes.

Included in these instructions for use are a number of real application cases that show the test results and the reporting of the grease condition.

1.1 Principle of operation

The kit allows many grease characteristics to be easily checked. However, the method shown in this instructions for use must be followed to get good and effective results. Chapter 3 gives detailed information on the method and procedures to be followed.

2. Content



A Sampling tools	D Contamination test
B Consistency test	
C Oil Bleeding test	

List of parts

Item number	Quantity	Description
1	1	Sampling syringe
2	1	Sampling tube
3	1	Permanent marker
4	10	Sample container
5	10	Disposable gloves (pairs)
6	1	Set of disposable spatulas (25 pieces)
7	1	250 mm spatula
8	1	150 mm spatula
9	1	Pair of scissors
10	1	Housing
11	1	Weight
12	1	Mask
13	4	Glass plates
14	1	Grease Sample Heater
15	1	AC/DC Adapter (US, UK, Australia)
16	1	Blotter paper pack
17	1	Ruler
18	1	Microscope
19	2	AAA LR03 lithium batteries
20	1	IFU leaflet
21	1	Carrying case

2.1 Technical data

Item number	Item	Description
1	Sampling syringe	Material: polypropylene
2	Sampling Tube	Material: PTFE, Length: approx. 1 meter
3	Permanent marker	Colour: black
4	Sample container	Material: polyethylene
5	Disposable gloves (pairs)	Material: grease resistant nitrile (synthetic rubber), powder free, Size: XL, Colour: blue
6	Set of disposable spatulas (25 pieces)	Material: plastic
7	250 mm spatula	Material: stainless steel
8	150 mm spatula	Material: stainless steel
9	Pair of scissors	Material: stainless steel
10	Housing	Material: aluminum
11	Weight	Material: stainless steel
12	Mask	Material: plexiglas
13	Glass plates	
14	Grease Sample Heater	
15	AC/DC Adapter (US, UK, Australia)	
16	Blotter paper pack	Set of 50 sheets
17	Ruler	Material: aluminum, graduated 0.5 mm
18	Microscope	Refer to Appendix 6.1
19	AAA LR03 lithium batteries	
20	IFU leaflet	
21	Carrying case	Dimensions: 530 × 110 × 360 mm (20.9 × 4.3 × 14.2 in.)

Weight complete kit: 3,2 kg (7.05 lb)

3. Analysis Protocol

The proposed protocol is shown in the table below. Information collected and test results obtained in each part can be reported in the report template available in the last section of this manual.

3.1 Collecting information	3.1.1 Application conditions 3.1.2 Grease in use	
3.2 Collecting samples	3.2.1 Material 3.2.2 Sampling procedure 3.2.3 Recommendations	
3.3 First Visual inspection	3.3.1 Examples	
3.4 Consistency test	3.4.1 Principle of operation 3.4.2 Material 3.4.3 Test Procedure 3.4.4 Recommendations	
3.5 Oil bleeding test	3.5.1 Principle of operation 3.5.2 Material 3.5.3 Test Procedure 3.5.4 Recommendations	
3.6 Contamination test	3.6.1 Principle of operation 3.6.2 Material 3.6.3 Test Procedure 3.6.4 Recommendations	
3.7 Reporting	3.7.1 Recommendations	

3.1 Collecting information

The ability of grease to lubricate correctly depends on the grease itself linked with external parameters. It is strongly recommended to collect as much information as possible on the application conditions and grease type used. The information collected can greatly help in interpreting the results.

For example:
A softening of grease can be caused by excessive vibrations, oil contamination, housing overfilled, and so on.
Knowing vibration levels, finding an oil can nearby the application or revising the amount of lubricant put at each relubrication interval can simplify analysis.

3.1.1 Application conditions

Take a note of the application conditions. This includes such things as:

- Application type (electrical motor, crusher, railways axlebox, vibrating screens, ...).
- Machine number or code (Pump 43).
- Last relubrication interval and quantity (date, amount in grams).
- Relubrication interval (hours).
- Bearing designation, type and size (deep groove ball bearing 6210, ...).
- Operating bearing temperature (70 °C).
- Load (C/P).
- Speed (n.dm).
- Ambient conditions (temperature, contamination, moisture, ...).
- Sealing type (mechanical seals, oil seals, ...).
- Operating bearing lifetime in hours.
- Vibrations (excessive, levels, ...).
- and so on.

3.1.2 Grease in use

Record if possible full information on the grease in use such as:

- Grease name, type, batch and brand
- Find grease specifications –
  Check NLGI grade or consistency value given by the manufacturer.
- Get if possible a fresh unused sample from the same can or batch
  (See chapter 3.2 for sampling procedures)
- Sometimes, the grease used is the wrong grease for the application.
  The suitability and relubrication intervals can be checked online[*)]:
  - LubeSelect for SKF greases

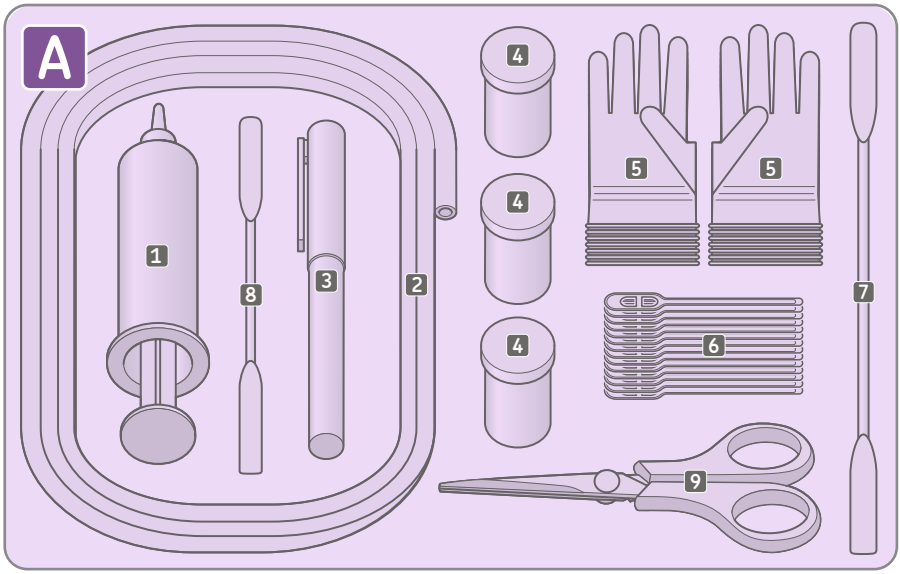
Note all your collected information on the provided report template on section 3.1: Application & lubrication conditions.

3.2 Collecting grease samples

Grease sampling is an important step of the analysis. Care should be taken when performing this step. Proper tools and good practices will improve accuracy of the tests.

Note: - It is not always easy to have a representative grease sample.
- To perform all the tests, just 0.5 gram (0.02 oz) of grease is needed.

3.2.1 Material



3.2.2 Sampling procedure

1. Ensure that the tools are clean and tidy.
2. Wear gloves.
3. Take a sample container. Using the pen provided, mark it with date of sampling and machine number/bearing position or with a unique identification referring to the report template.

Mark both lid and container to avoid mismatch
(Grease quantity in the picture is 0.5 gram, 0.02 oz)

4a **If bearing is accessible**, use provided stainless steel spatulas - Best sampling areas are on the cage bars, on the raceways or just besides the roller set.
Put the grease sample directly in the marked sample container and do not fill it completely. 0.5 gram is sufficient for one analysis.
If sample will also be used later, for trend analysis for instance, take a bigger sample.

4b **If the bearing is not accessible**, use tube (cut 10-15 cm, 4-6 in.) and syringe to suck grease through the housing by removing grease nipples. In case of sampling through grease escape holes, clean hardened and dirty grease before operation. On slewing bearings, inspection screw can be removed and tube inserted to collect sample.

Pump grease. 4 to 5cm (1.5 - 2 in.) of tube should be filled with grease and put it in the sample container waiting for analysis. Be sure to keep half a centimeter ($^1/_4$ in.) of tube clean to pump it back in the container!
The grease should not reach the syringe. These samples are less representative than the ones taken directly from the bearing, but can still help to spot some issues.

Tube in sample container

Fill in the provided report template section 3.2: Collecting samples.

3.2.3 Recommendations

- Get an additional fresh unused sample whenever possible. Make sure to sample it in a clean way from the original grease can or cartridge.
- If housing is dismounted or bearing accessible, look where the grease is before sampling. Look at filling level as well as colour differences. Take samples of extreme colours.
- Grease can be taken from the seals with the supplied stainless steel spatulas.
- Avoid taking samples too close to the filling point.
- Look at the grease at the filling point – Is the grease very different from the one in the bearing?
- Do not use wooden spatulas (oil sucked through the wood fibres can influence results or wood fibres can contaminate the grease).
- Do not mix greases from different bearings and/or housings in the same container!
- Do not use transparent containers. Use containers provided.
- Look around the machines – such things as wrong grease cartridges, wrong lube type and so on can give indications on mistakes.
- For trend analysis, take the sample always at the same sampling position.
- Take application photos if possible.

Example of bad sampling methods

Bad marking

Broken sample container

Transparent container

Inappropriate

Inappropriate container

Too much grease

3.3 First Visual inspection

After the sample has been taken, a visual inspection should be first carried out.
This gives a first indication on grease status. Use the unused fresh grease sample as a reference.

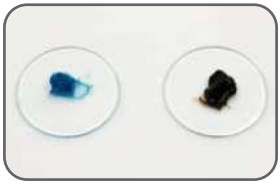
These are some grease aspects to look at:

- Grease should have a shiny, oily appearance. If not, the base oil has been probably used up
- Darkening of the grease can result from high bearing temperature (oxidation, carbonization) or solid contaminants. Note that some greases are originally black, e.g. those containing MoS_2 or graphite
- Change in smell often results from oxidation
- Various aspects in colour, transparency, smell can result from mixing lubricants or from lubricants incompatible with the material used for surrounding machine components, for instance a brass cage
- General grease texture may be an indicator of bearing operating conditions. Normally, the texture of a grease should change very little during service. It should be smooth with no grit or lumps. If either is present, the grease can be contaminated
- Note all these changes.

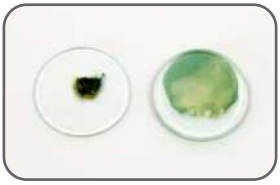
Note: A blackening of the grease does not necessarily mean that the grease is not good.

Fill in the provided report template section 3.3: First visual inspection

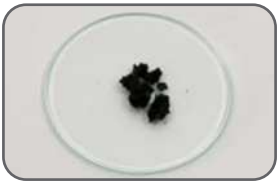
3.3.1 Examples



Darkening



Various aspects in colour - grease contamination



Dryness - extreme case

3.4 Consistency test

Grease consistency is an important grease parameter that determines stiffness of the grease. The choice of a certain consistency for a certain application depends on many operating conditions such as temperature, speed, shaft alignment, pumpability and so on.

For example:
- Vertical shaft arrangements calls for stiff greases
- Low operating temperatures calls for low consistency greases in general
- and so on

Grease consistency is classified according to a scale developed by the NLGI (National Lubricating Grease Institute). This is based on the degree of penetration achieved by allowing a standard cone to sink into the grease, which has been worked for 60 strokes in a grease worker, at a temperature of 25 °C (80 °F) for a period of 5 seconds. The depth of penetration is measured on a scale of 10^{-1} mm and the softer greases allow the cone to penetrate further into the grease, hence the higher penetration number. The test method is in accordance to ISO 2137.

NLGI Number	ASTM 60 strokes worked penetration (10^{-1} mm)	Appearance at room temperature
000	445-475	Very fluid
00	400-430	Fluid
0	355-385	Semi-fluid
1	310-340	Very soft
2	265-295	Soft
3	220-250	Medium hard
4	175-205	Hard
5	130-160	Very hard
6	85-115	Extremely hard

Note: Greases for bearing applications have generally a NLGI value between 1 and 3.

Once a certain consistency has been chosen for a certain application, it should not change drastically during the advised relubrication interval or storage time. This is related to grease mechanical stability. These are some possible causes for a consistency change:

Softening (Lower NLGI value) of the grease can be caused by:

- Grease with too soft consistency or poor mechanical stability used in vibrating application.
- Bearing housing filled too much for the speed used. This creates churning and excessive grease shearing.
- Excessive temperature for the grease used.
- Rotating outer ring application filled too much and/or unsuitable housing design.
- Water in grease.
- Leakage of oil from neighbouring systems.
- Mixing of incompatible greases.
- Shelf life exceeded.

Hardening (Higher NLGI value) of the grease can be caused by:

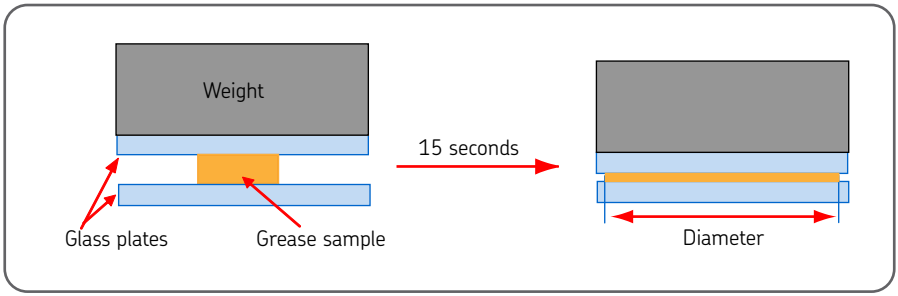
- Grease has lost base oil due to exceeded relubrication interval (see oil bleeding test), or because of evaporation due to continuous use at high temperature/poor grease quality if changes happen fast.
- Certain grease can harden after extensive mechanical working.
- Mixing of incompatible greases.
- A large amount of solid contaminants (carbonized particles for instance).
- Shelf life exceeded.

3.4.1 Principle of operation

Under field conditions, it is virtually impossible to determine consistency using the ISO 2137 method.

Instead, the grease test kit allows a suitable method to perform this test in the field.

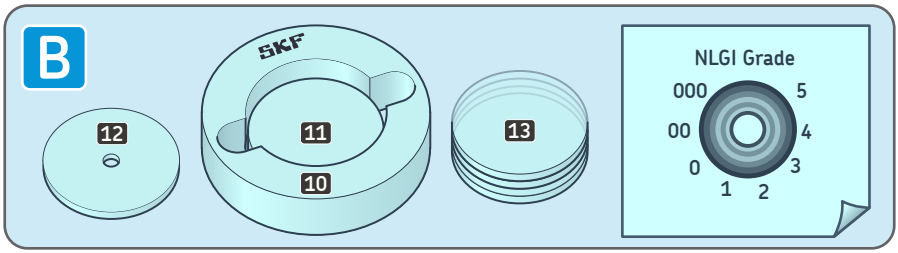
A fixed grease volume is spread between two glass plates for 15 seconds by means of the weight. By comparing the grease stain obtained with the calibrated measuring scale, the consistency of the grease can be evaluated.



3.4.2 Material

Preparation before test:

- Print the calibrated measuring scale with right printer settings (please check last section of this manual). Do not scale to page!
  To check if the print out is the correct one, the outside diameter of the housing should be the same as the circle drawn on the calibrated measuring scale.
- Grease samples should be at temperature between 15 °C and 30 °C (59 °F and 86 °F).
- Wristwatch or clock to measure 15 seconds (not provided).

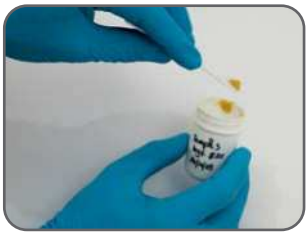


3.4.3 Test procedure

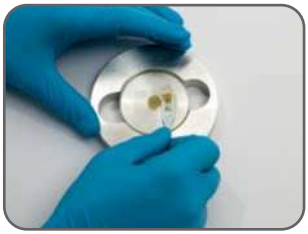
1. Ensure all components are clean
2. Wear gloves
3. Place weight in the housing

4. Place one glass plate on top of the weight

5. Place mask on top of the glass plate

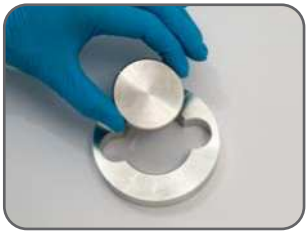


6. Take the grease sample to analyze from the sample container using a disposable spatula



7. Apply the grease in the mask. Make sure that hole is full with grease and wipe off excess on the top.

8. Remove carefully mask. Grease should stay on the glass plate.

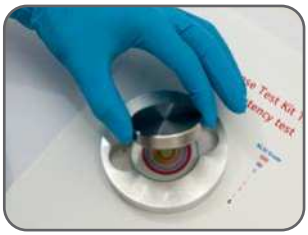


9. Remove glass plate (with grease) and the weight from the housing.

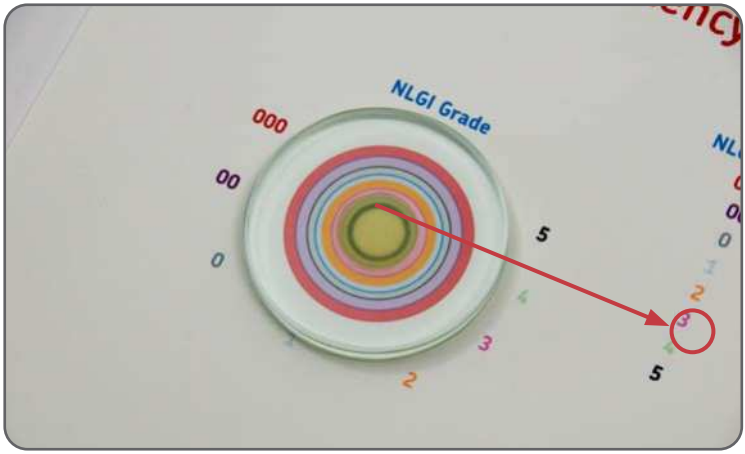
10. Put the housing on the calibrated scale, insert glass plate containing grease face up in the housing (grease should not be on the paper side!) – Align the grease spot with the centre of the scale.

11. Take the weight and the second glass plate together with the glass plate beneath the weight, lower gently on the housing. The weight should not touch the grease!

12. Wait 15 seconds.



13. Remove the weight gently from the housing.



14. Read consistency number by looking at which zone is located the under grease stain – Use the colour code to determine NLGI class.

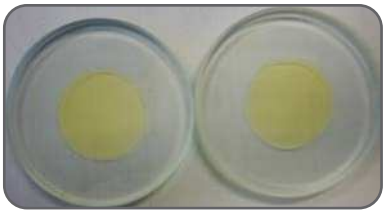
Fill in the provided report template section 3.4: Consistency test.

Note: Keep the sample for test D!

3.4.4 Recommendations

It is good practice to test both a used and fresh/unused sample of the same grease. By comparing the two stains obtained, differences in stiffness within the same NLGI grade can be observed.

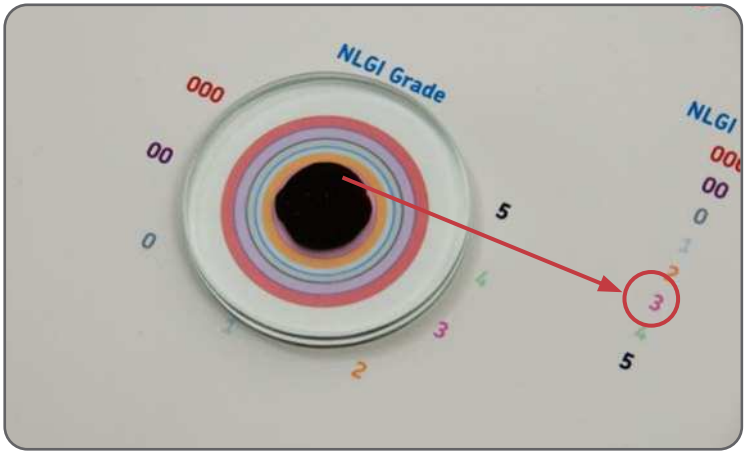
fresh *used*



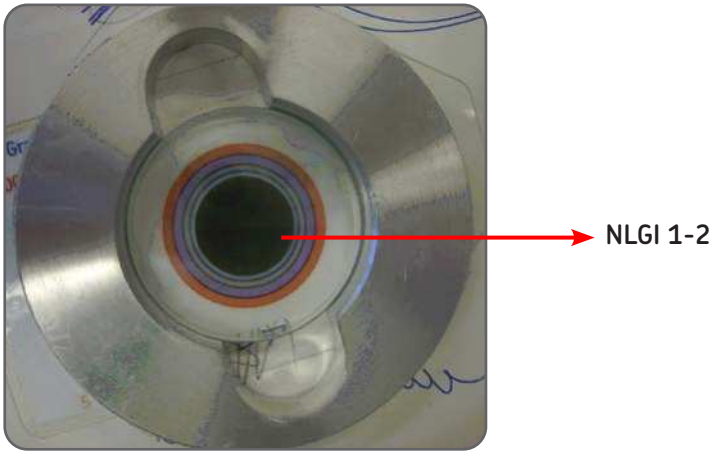
fresh *used*

When fresh samples are used, stir them for 30 seconds with a spatula prior testing.

When used samples are tested, it can happen that the stain obtained is not very round. This might be due to several reasons such as non homogeneity of the sample and/or contaminants blocking the spreading in some directions. In this case, take an average.



When a stain is exactly in between two grades, grease could be classified as a NLGI 1-2 for example.



Reminder: The test is meant to be performed at 15-30 °C (60-85 °F). If temperature is different, the NLGI grade will be given at this temperature.

3.5 Oil bleeding test

Base oil makes up 60-95% of a grease. As base oil in grease continuously bleeds out (although the rate of bleeding gets slower and slower with time), grease dries out. The time scale for this process depends on a number of factors such as operating temperature. This process is called ageing.

Base oil in greases has a certain kinematic viscosity expressed in mm^2/s or Cst. High temperature could promote its oxidation and thus increase its kinematic viscosity.
The amount and viscosity of the base oil should not change drastically within the advised relubrication interval.

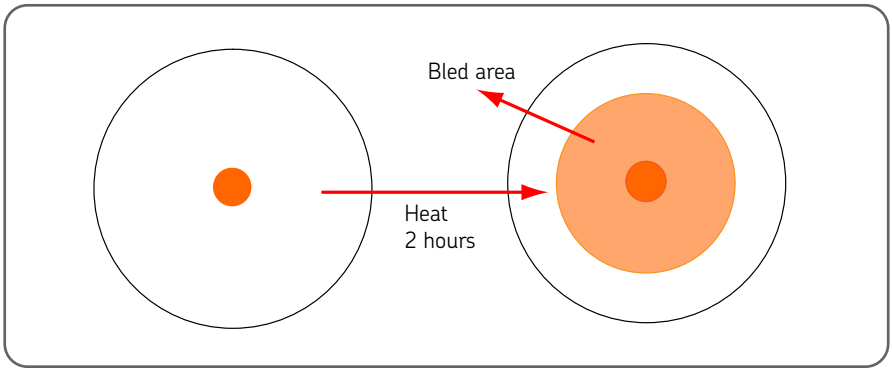
These are possible causes for a change in oil bleeding properties:

A lower bleeding might be due to (used compared to fresh)
- Loss of base oil (generally accompanied with an increase in consistency).
- Base oil oxidation leading to base oil viscosity increase due to high temperature.
- Big amount of hard particles.
- Mix of greases.

A higher bleeding might be due to:
- Grease can not keep base oil into its structure due to intensive shearing or vibrations. (especially true for sheared polyurea greases).
- Oil contamination from neighbouring systems.
- Mix of greases.
- Grease with poor mechanical stability.

3.5.1 Principle of operation

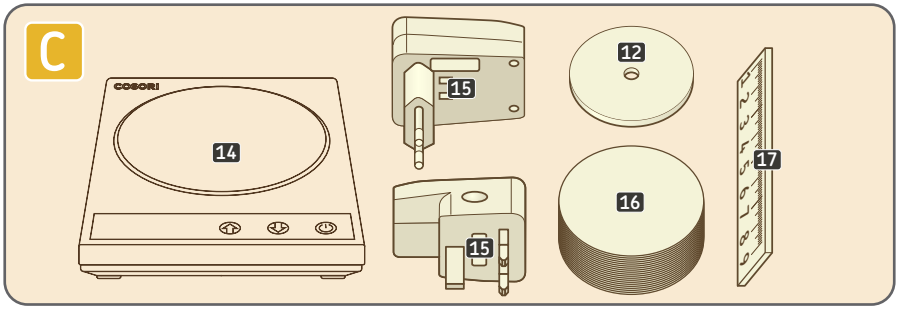
A fixed amount of grease is put on a piece of the blotter paper provided. By heating this paper for two hours, the base oil will be released from the grease and create an oil stain on the paper. By measuring the diameter of the stain formed, calculating the bled area and comparing with the area given by an unused fresh sample, the change in bleeding properties can be evaluated.



3.5.2 Material

Preparation before test:

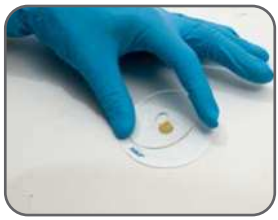
- A calculator is required (not provided with the kit).
- Use only blotter paper provided.



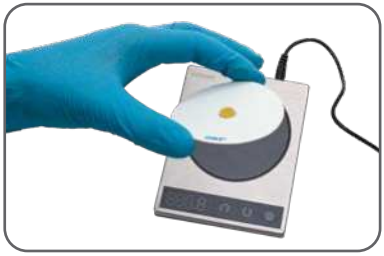
3.5.3 Test procedure

1. Ensure all components are clean.
2. Use gloves.
3. Connect the supplied heater to a power outlet.
   Turn on the heater by pressing the power button.
   Set the temperature to 60 °C (140 °F)

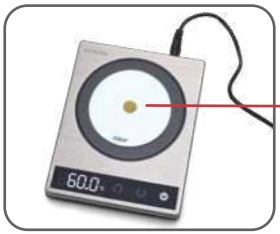
4. Using the mask, apply grease sample on the blotter paper. The hole should be completely filled with grease. Wipe the excess away and remove carefully the mask.

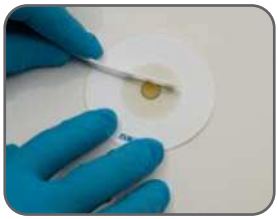


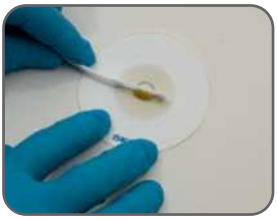
5. Place the blotter paper containing the grease sample on top of the heater for two hours. Hold the paper by the edge and avoid touching the heater.

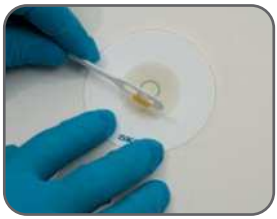


6. The base oil spreads through the paper. After two hours, remove carefully the blotter paper and remove grease from it.

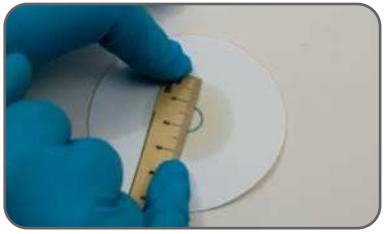


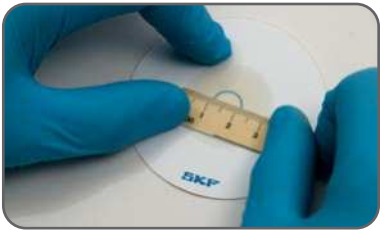






7. The stain left is slightly elliptical. This is due to the paper fibres orientation. To be more precise, take both minor and major diameters using the ruler (millimeters) and make an average value of them.





8. Using the following formula calculate the bled area reported to an equivalent circle:

S_{Fresh} is the bled area from the fresh unused sample

S_{Used} is the bled area from the used sample

$D_{AvFresh}$ is the diameter average value (in mm) of the two dimensions taken in 7 for the fresh unused sample

D_{AvUsed} is the diameter average value (in mm) of the two dimensions taken in 7 for the used sample.

$$S_{.....} = 0.785 \times \left(D^2{}_{Av.....} - 100 \right)$$

9. Repeat procedure with the second sample (used sample if fresh one was tested first or inversely).

10. Calculate the bleeding difference in percentage compared to the fresh sample.

Note: $\%_{Diff}$ represents the bled area difference between the used and the fresh sample.

$$\%_{Diff} = 100 \times \frac{\left(S_{Used} - S_{Fresh} \right)}{S_{Fresh}}$$

- If result is negative, then bleeding is reduced.
- If result is positive, then bleeding is increased.

Fill in the provided report template section 3.5: Oil bleeding test.

For example:

Dimensions found after testing for the fresh unused sample are: 28 mm and 29 mm,

$$D_{AvFresh} = 28.5mm$$

This leads to

$$S_{Fresh} = 0.785 \times \left(28.5^2 - 100\right) = 560mm^2$$

Dimensions found after testing for the used sample are: 22 mm and 23 mm,

$$D_{AvUsed} = 22.5mm$$

This leads to

$$S_{Used} = 0.785 \times \left(22.5^2 - 100\right) = 319mm^2$$

Bleeding difference calculation leads to:

$$\%_{Diff} = 100 \times \frac{\left(319 - 560\right)}{560} = -43\%$$

Negative result means that used grease is bleeding 43% less than fresh unused grease.

3.5.4 Recommendations

Once the test has been done for a fresh unused grease sample, record the value for later. Only the used sample test will need to be performed for further analysis.

Make sure that the fresh sample and used samples are heated within the same temperature range (+/- 5 °C will not considerably influence the result).

Perform the test at room temperature 15 °C to 30 °C (59 °F to 86 °F). If temperature is below or above, the heater might not reach the testing temperature. The heater might not reach testing temperature if test is performed in a windy environment.

Severe contamination can, in certain cases block oil bleeding and result will show a consequent difference, while the grease still seems to be oily. This might happen if the sample taken is a mix of used grease and grease added during a relubrication interval.

3.6 Contamination test

Grease should be free of contaminants. Contaminated grease will reduce bearing performance and lifetime can be reduced to a large extent.

Contamination can be of several natures:

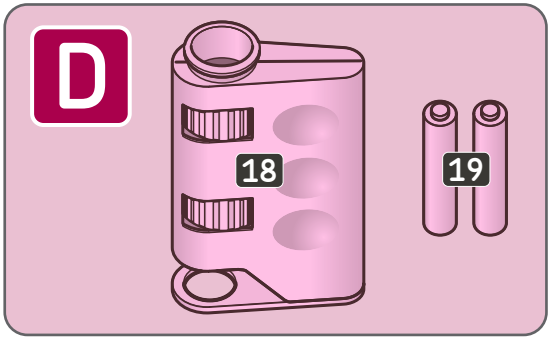
- Contamination coming from the outside, introduced by poor sealing, dirty grease guns, poor bearing mounting methods.
  This type of contamination can be of several natures (sand, water, dust, fibers, steam flow ..).
- Lubricant contamination (oil from neighbouring systems or wrong grease introduced).
- Contamination because grease reached end of life. Carbonized particles are formed and stick to surfaces promoting friction.
- Bearing wear material.

3.6.1 Principle of operation

- Looking at size, amount, shape and nature of those contaminants gives an indication on the proper functioning of the bearing.
- After the consistency test has been performed, the grease spread between the two glass plates can be inspected by using a microscope.

3.6.2 Material

Preparation before test:
- insert batteries in the microscope.
- use sample already compressed between the two plates from test B.

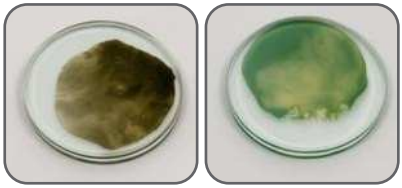


3.6.3 Test procedure

1. Ensure all components are clean.
2. Use gloves.
3. After the consistency test has been performed, insert the weight again in the housing. Use a white background (or light colour).
   Note: the grease sample is still between the two glass plates.

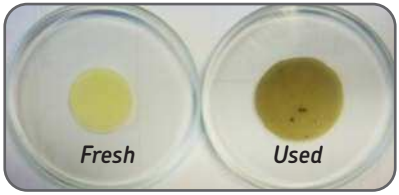
4. Press on the weight, so the grease can spread further and then remove the weight. The grease film becomes very thin (around 100 micrometers).

5. Look with the naked eye for particles, non homogeneity, transparency differences, grit, lumps and so on. This will complement the first visual inspection. If a fresh sample is available, compare both.

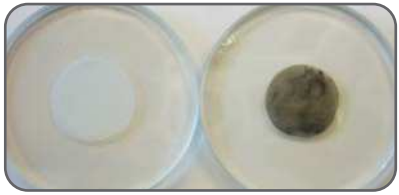


Lube contamination

Carbonized particles Relubrication



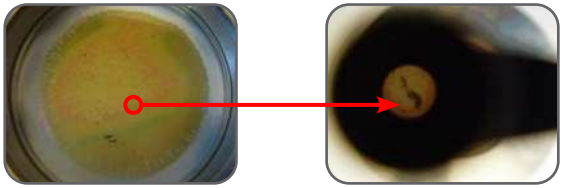
Oil contamination

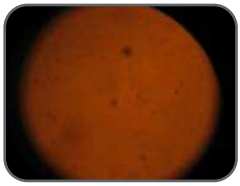


Darkening during use

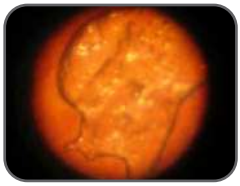
6. Switch on the light, put the microscope on top of the glass plates and look through the lens. Glittering of particles may indicate their metallic nature and thus hardness.

Metallic contamination



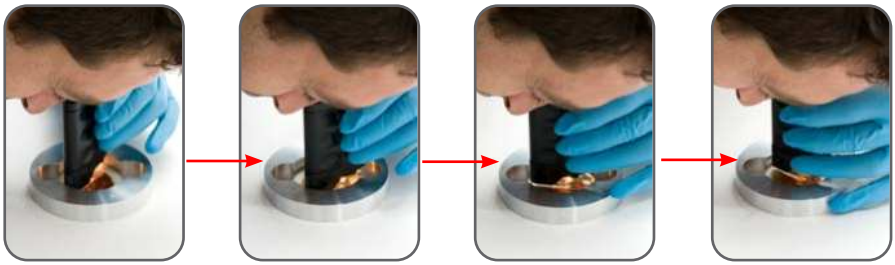


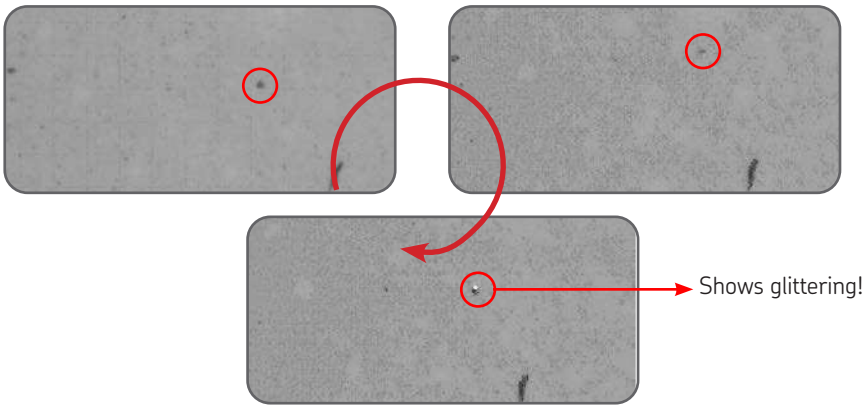
Oxidation particles

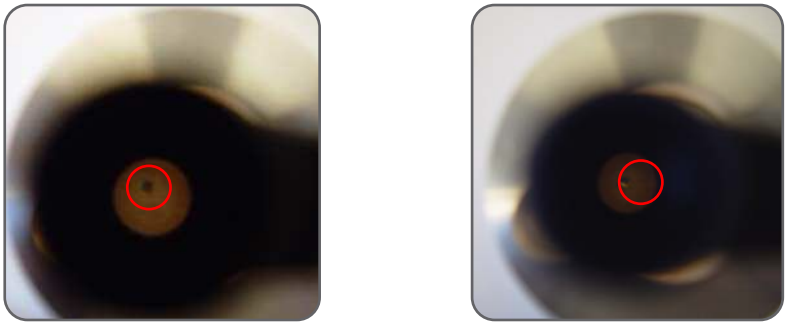


Thickener agglomerate

7. It might be useful to make those particles rotating to observe them in different positions. To perform this, press the microscope on the glass plates while making it turn. This allows the plate in contact with the microscope to rotate while the second plate stays static. A shearing motion is created within the grease sample making particles move and rotate.







Black particle (due to f.e. oxidation, seals etc)

When turning shows glittering!

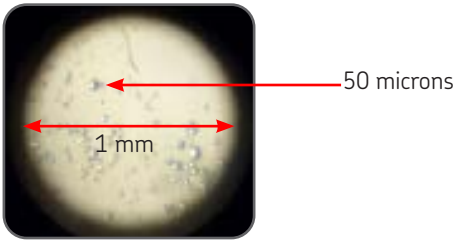
Fill in the provided report template section 3.6: Contamination test.

3.6.4 Recommendations

Before using the microscope, take time to look at the glass plates. The human eye can detect particles sized 40 microns, which are already big contaminants.

In the lower magnification, the observable window is about 2 mm and 1 mm for the bigger magnification. This gives an idea of real size of contaminants.

Fresh sample intentionally contaminated with known sized contaminants



Look for glittering.
Making the particles rotate can scratch the glass plates. Consider to change the glass plates from time to time.

3.7 Reporting

Usage of the report template:

- Print report template which can be found at the end of this manual.

- The report template has two pages:
  - The first page is related to application conditions & lubricant used and the SKF LubeSelect section. Once this part has been filled with information, it should not change unless machine operating condition change consequently.
  - The second page is related to the sample taken, testing and interpretation. This page should be used each time a new sample has to be tested.
  - The machine number and bearing position section appears on both pages to ensure traceability when report template is printed on two separate pieces of paper.

  The sections to fill in the report template are numbered similar as the instructions for use for clarity purpose. Read instructions for use chapter prior to fill report template.

- Once information has been added and tests conducted, refer to instructions for use (especially chapter 4. Reference cases and beginning of chapters 3.4, 3.5 and 3.6) to interpret results obtained.

3.7.1 Recommendations

- **Important**:
  Use the summary at the end of chapter 4. By placing a point on it (depending on results found), an evaluation of how critical the sample is can be compared to reference cases.

- When monitoring/trending an application with time, it is not likely that the first page of report template changes. Once filled, only the second page would need to be printed.

4. Reference cases

In this chapter four different reference cases are listed representing possible analyses that can be performed with the kit.
For better understanding, only main information is given in de reference cases. The applied colour code helps finding the examples in the summary at the end of this chapter.

4.1 Grease shelf life / Quality

Application & lubrication conditions:

- 2 stored greases in good storage conditions.
- Samples taken from cans after 3 years.

Greases used:

- Grease A – Lithium / PAO - NLGI 2;
- Grease B – Aluminum complex / PAO-Ester - NLGI 1

Nature of analysis:

☒ Shelf life/Quality	☐ Routine control	☐ Damage
☐ Grease performance	☐ Trend analysis	☐ Change of grease
☐ Contamination expected	☐ Other reasons:	

Testing

Sample	First visual inspection (3.3)	Consistency test (3.4)	Oil bleeding test (3.5)	Contamination test (3.6)
Fresh unused: Grease A	White	NLGI class: 2	$D_{AvFresh}$: 44 mm S_{Fresh} : 1441 mm²	
Stored: Grease A	Oil layer on top of grease bulk. Grease is strirred in the can before to be sampled.	After stirring NLGI class: 2 NLGI difference: 0	D_{AvUsed} : 44 mm S_{Used} : 1441 mm² %Diff : 0	No
Fresh unused: Grease B	White	NLGI class: 1	$D_{AvFresh}$: 40 mm S_{Fresh} : 1177 mm²	
Stored: Grease B	Oil layer on top of grease bulk. Grease is stirred in the can before to be sampled.	After stirring NLGI class: 00 NLGI difference: -2	D_{AvUsed} : 40 mm S_{Used} : 1177 mm² %Diff : 0	No

Interpretation

Grease A:	- Mechanical properties unchanged after stirring According to specifications
Grease B:	- Mechanical properties changed (softening) Out of specifications

4.2 Grease life / trend analysis

Application & lubrication conditions:

- Medium sized electrical motor.
- Four samples taken received at three intervals with 2 month in between.

Grease used:

- Polyurea / Mineral - NLGI 2.5.

Nature of analysis:

☐ Shelf life/Quality	☐ Routine control	☐ Damage
☐ Grease performance	☒ Trend analysis	☐ Change of grease
☐ Contamination expected	☐ Other reasons:	

Testing

Sample	First visual inspection (3.3)	Consistency test (3.4)	Oil bleeding test (3.5)	Contamination test (3.6)
Fresh unused 1	Fresh, blue colour	NLGI class: 2.5	$D_{AvFresh}$: 29 mm S_{Fresh} : 581 mm²	
Sample: 2 (2 months)	Light darkening, oily	NLGI class: 2.5 NLGI difference: 0	D_{AvUsed} : 28 mm S_{Used} : 537 mm² %Diff : -8	Few particles. Mainly carbonized particles Small sized
Sample: 3 (4 months)	Stronger darkening, oily	NLGI class: 3 NLGI difference: +0.5	D_{AvUsed} : 27.5 mm S_{Used} : 515 mm² %Diff : -11.5	Few particles. Mainly carbonized particles Small sized
Sample: 4 (6 months)	Severe darkening, little oily (sticky, dry)	NLGI class: 3.5 NLGI difference: +1	D_{AvUsed} : 22 mm S_{Used} : 301 mm² %Diff : -48	Many big carbonized particles.

Interpretation

Sample 2:	- Sample in good condition
Sample 3:	- Sample in good condition
Sample 4:	- Advanced grease degradation **Reconsider relubrication interval**

4.3 Grease selection

Application conditions:

- Spherical roller bearing 22213 E/C3.
- Speed : 2390 rpm, n.dm=200 000.
- Load C/P: 31 - Low.
- Temperature self induced (80-90C).
- Quantity lubricant: 20 grams (0.7 oz).
- Sampled from cage.

Two greases tested (Same running time):

- A - Lithium/Mineral EP NLGI 2.
- B- Lithium/PAO NLGI 2.

Nature of analysis:

☐ Shelf life/Quality	☐ Routine control	☐ Damage
☒ Grease performance	☐ Trend analysis	☐ Change of grease
☐ Contamination expected	☐ Other reasons:	

Testing

Sample	First visual inspection (3.3)	Consistency test (3.4)	Oil bleeding test (3.5)	Contamination test (3.6)
Fresh unused A	Brown	NLGI class: 2	$D_{AvFresh}$: 29 mm S_{Fresh} : 581 mm^2	
Used: A	Darkening, many carbonized particles, strong smell, oily	NLGI class: 3 NLGI difference: +1	D_{AvUsed} : 23 mm S_{Used} : 336 mm^2 %Diff : -42	Yes – Many big carbonized particles – Some small metallic particle
Fresh unused: B	White	NLGI class: 2	$D_{AvFresh}$: 44 mm S_{Fresh} : 1441 mm^2	
Used B	Darkening, oily	NLGI class: 2.5 NLGI difference: +0.5	D_{AvUsed} : 40 mm S_{Used} : 1177 mm^2 %Diff : -18	Yes but restricted and very fine. Dispersed

Interpretation

Sample A:	Advanced grease degradation.
Sample B:	Sample in good condition.

4.4 Contamination

Application conditions:

- Wind turbines main shaft bearing.
- Large size Spherical roller bearing.
- High load, low speed, standing still conditions.
- 2 samples (1 & 2) taken from two different wind turbine parks – Sampled from housing.

Grease used in both applications (similar grease):

- Lithium/Mineral – NLGI 1.

Nature of analysis:

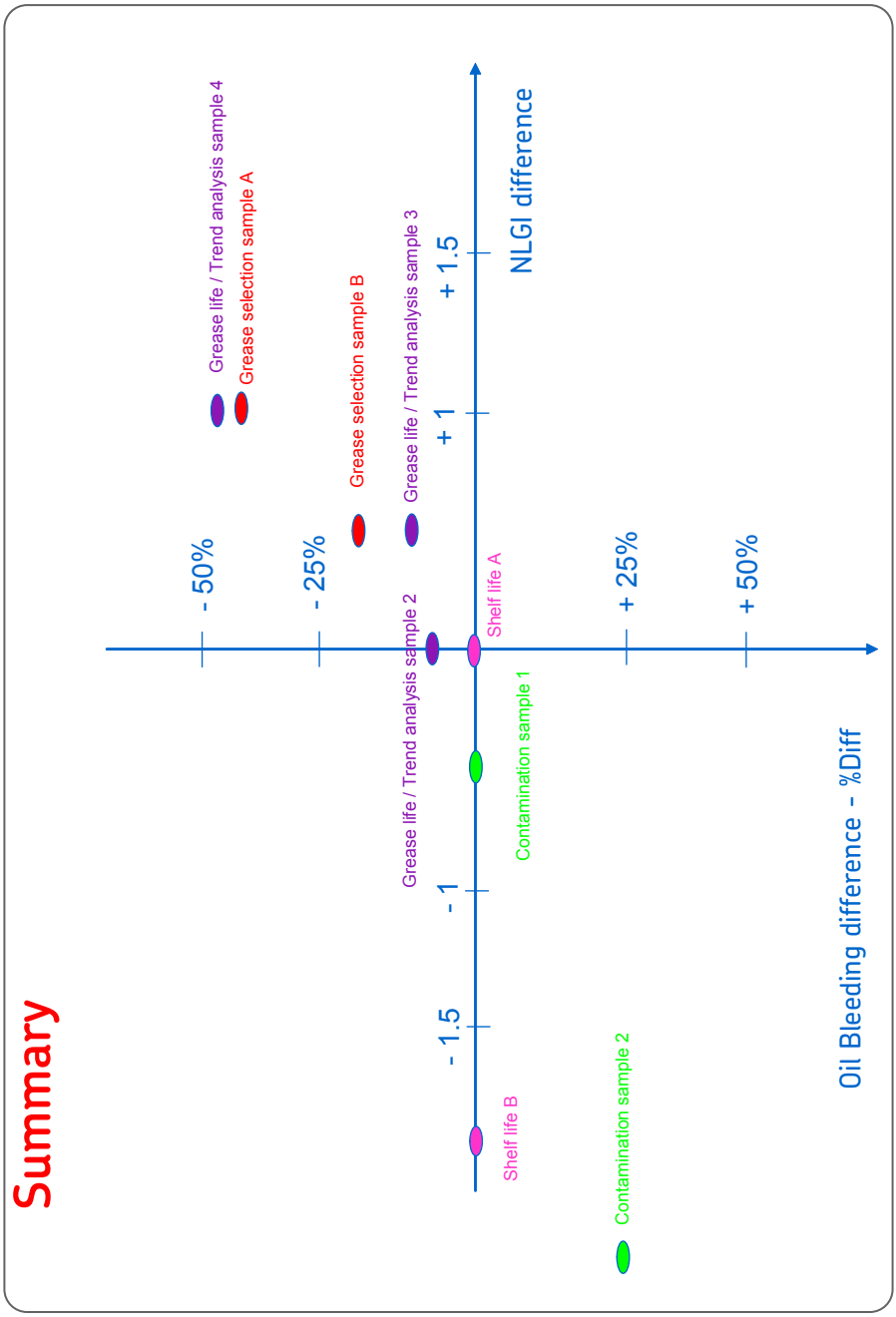
☐ Shelf life/Quality	☐ Routine control	☐ Damage
☐ Grease performance	☐ Trend analysis	☐ Change of grease
☒ Contamination expected	☐ Other reasons:	

Testing

Sample	First visual inspection (3.3)	Consistency test (3.4)	Oil bleeding test (3.5)	Contamination test (3.6)
Fresh unused	Brown	NLGI class: 1	$D_{AvFresh}$: 40 mm S_{Fresh} : 1177 mm²	
Sample: Wind turbine park 1	Brown, oily	NLGI class: 0.5 NLGI difference: -0.5	D_{AvUsed} : 40 mm S_{Used} : 1177 mm² $\%_{Diff}$: 0	Very few and small sized particles
Sample: Wind turbine park 2	Darkening, oily	NLGI class: 000 NLGI difference: -3	D_{AvUsed} : 44.5 mm S_{Used} : 1476 mm² $\%_{Diff}$: +25	Many big particles

Interpretation

Sample 1:	- Sample in good condition.
Sample 2:	- Severe grease softening. **Check for possible sources of oil contamination.** **Check sealing and leakage.**


Summary
Grease life / Trend analysis sample 4
Grease selection sample A
Grease selection sample B
Grease life / Trend analysis sample 3
Grease life / Trend analysis sample 2
Shelf life A
Contamination sample 1
Shelf life B
Contamination sample 2
- 50%
- 25%
+ 25%
+ 50%
+ 1.5
+ 1
- 1
- 1.5
NLGI difference
Oil Bleeding difference - %Diff

5. Maintenance

5.1 Cleaning

- Make sure parts are always clean, especially glass plates and sampling tools. Suitable cleaning agent should be used (Loctite 7070 for instance).
- Clean glass plates with a tissue first to remove most of the grease.

5.2 Spare parts

Designation	Description	
TKGT 1-RK1	Spare part kit	
Description	**Quantity / Size**	**Item no. (See chapter 2. Content)**
Sampling tube	2 meter	2
Sample containers	20	4
Gloves	20 pairs	5
Disposable spatulas	2 sets	6
Mask	1	12
Blotter paper	1	16

Designation	Description	
TKGT 1-RK3	Spare part kit	
Description	**Quantity / Size**	**Item no. (See chapter 2. Content)**
Glass plates	2	13
Mask	1	12
Blotter paper pack	4	16

Designation	Description
TDTC 1/C	General toolcase without inlay, size C

6. Appendixes

In this IFU the following documents are available as PDF:

6.1 Microscope

6.2 SKF Report Template

6.3 SKF Consistency test scale

Instructions for MM-100 MicroMax

The *MicroMax* is a portable, lighted pocket microscope equipped with two knobs that independently adjust the magnification (marked "zoom") and the clarity of image (marked "focus").

The "zoom" knob adjusts the focal length, which in turn determines the magnification. By turning the knob wheel, you can change the magnification of the item being viewed from 60x to 100x times closer.

The other wheel marked "focus" adjusts the clarity of the image once a power range is established. Simply turn the focus knob while viewing an object until the image becomes clear and crisp. It may be necessary to re-focus the image when viewing an object if the magnification is changed during the viewing.

The switch that powers the lamp is located at the end opposite the viewing lens. It is recommended that this light be turned on at all times while using the device for optimum viewing results. The lamp is powered by two AAA batteries (not included).

It is also important to note that the image you see will be inverted. This is perfectly normal and is common in all high magnification tools such as microscopes and telescopes.

Date: ..... /..... /.....

SKF Grease Test Kit TKGT 1 - Report Template

Application & lubrication conditions (Refer to chapter 3.1 in the instructions for use)

Application type:			
Machine number (bearing position):			
Bearing type and designation:			☐ With W33 design ☐ N/A
Bearing operating temperature:	☐ °C ☐ °F	**Ambient temperature:**	☐ °C ☐ °F
Rotational speed n (r/min):		**n.d_m value:**	**d_m = 0.5*(d+D)** **d**: Inner bore diameter, mm **D**: Outer ring outside diameter, mm
Load (C/P):			☐ unknown **C**: Basic dynamic load rating, kN **P**: Equivalent dynamic bearing load, kN

Special conditions:	☐ Vertical shaft	☐ Outer ring rotation	☐ Oscillating movements
	☐ Vibrations	☐ Standing still	☐ Shock loads
	☐ Others (decribe):		
Sealing type:	☐ Mechanical seals	☐ Labyrinth seals	☐ Oil seals
	☐ Shields	☐ Sealed for life	
	☐ Other (decribe):		
Ambient conditions:	☐ Dry	☐ Humid	☐ Dirty/dusty
	☐ Contaminants	☐ Other (describe):	

Current lubrication conditions

Grease in use (name):	☐ unknown				
Basic specifications:	**NLGI Class:**		**Thickener type:**		**Base oil type:**	
Relubrication interval (hours):	☐ unknown		**Relubrication quantity (grams):**		☐ unknown	
Relubrication method:	☐ Manual	☐ Automatic lubricator		☐ Centralized lubrication system	
	☐ Other (describe):				

Recommendation given by SKF LubeSelect (*http://www.skf.com/portal/skf/home/aptitudexchange*)

Grease (name):			
Relubrication interval (hours):		**Quantity (grams)**	

Notes:

.....

.....

.....

Machine number (bearing position):	

Nature of analysis:

☐ Shelf life/Quality	☐ Routine control	☐ Damage
☐ Grease performance	☐ Trend analysis	☐ Change of grease
☐ Contamination expected	☐ Other reasons:	

Collecting sample (Refer to chapter 3.2 in the instructions for use)

Sample name:				
Date of sampling:				
Date of last relubrication:				
Sample location:	☐ Bearing	☐ Bearing raceways	☐ Bearing cage	☐ Between roller elements
	☐ Seal	☐ Housing	☐ Other::	
Bearing operating time (hours):				☐ unknown

Testing (Refer to chapters 3.3 to 3.6 in the instructions for use)

Sample	First visual inspection (3.3)	Consistency test (3.4)	Oil bleeding test (3.5)	Contamination test (3.6)
Fresh unused (name):		**NLGI class:**	$D_{AvFresh}$: .....mm S_{Fresh} : .....mm^2	
Used (name):		**NLGI class:**	D_{AvUsed} : .....mm S_{Used} : .....mm^2	
Changes:		**NLGI difference:**	$\%_{Diff}$:.....	

Interpretation (Refer to chapter 3.7 & 4 in the instructions for use)

.....

.....

.....

Inspector /Technician:	

SKF Maintenance Products

MP5366E-1 · 2009/11 · © SKF 2009
® SKF is a registered trademark of the SKF Group

www.mapro.skf.com
www.skf.com/lubrication

SKF Consistency test scale - TKGT 1

NLGI Grade

Printing tip:
For correct scaled print always select
Page Scaling: None

SKF Maintenance Products
MP5366-2 · 2009/11 · © SKF 2009

skf.com | mapro.skf.com | skf.com/mount

MP5366 EN · 2022/09