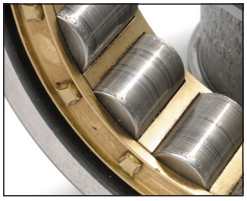
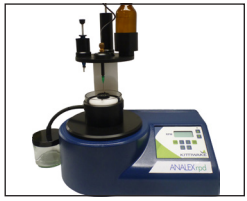
ANALEXrpd





Installation and Operation Manual

KITTIWAKE
monitoring innovation

ANALEX rpd

Rotary Particle Depositor
Installation and Operation Manual

MA-K19082-KW Issue 2

November 2014

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1. Introduction

Key to Symbols

 = Caution

 = Note – Important information and helpful hints and tips

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Do Not Discard This Manual

This Installation and Operation Manual is a functional part of the ANALEXrpd product and must be kept for future reference.

 Please retain all original packaging for shipping purposes. Kittiwake will not be liable for damage to returned goods resulting from inadequate packaging.

1.1 About

The Analex RPD (Rotary Particle Depositor) extracts wear debris from a carrier fluid by the action of magnetic, centrifugal and gravitational forces on the debris. The debris is deposited onto a substrate in the form of three concentric rings termed the middle, inner and outer rings. During the deposition process the wear debris also undergoes a sizing operation so that the inner ring will contain a full particle size range, the middle ring intermediate and small sized particles and the outer ring small sized particles.

An analysis of these particles can give an indication of the type of wear taking place, and whether it is active or benign wear, by the observation of the distinctive features or compositional aspects of the particles being produced (see the accompanying manual ‘Guide to Wear Particle Recognition’).

1.2 CE Notice

This product complies with the following standards in accordance with the European Directives:

Electromagnetic Compatibility EMC Directive 2004/108/EC	
EN61326-1:2006	Electrical equipment for measurement, control and laboratory use – EMC requirements.

Low Voltage Directive (LVD) 2006/95/EC	
EN61010-1: 2001	Safety requirements for electrical equipment for measurement, control and laboratory use. General requirements.

2. Safety Summary

Please ensure you thoroughly read and understand this user manual before attempting to operate the ANALEXrpd.

If the equipment is used in a manner, or for a specific purpose other than that described in this user manual, then any safety protection may be impaired.

- Never disassemble, repair, or tamper with the ANALEXrpd.
- Ensure that the supply voltage is within the specifications with means of isolation fitted.
- Check all wiring for correct connection before powering the unit.
- The ANALEXrpd and power supply contains no user serviceable parts. Do not disassemble.
- When handling oil samples and chemicals, appropriate PPE should be worn. This includes but is not limited to protective gloves, laboratory coat and safety goggles.
- The ANALEXrpd has a rotating carousel. Care should be taken to avoid damage to the equipment or injury to the user.
- Ensure that filling and discharge tubes are firmly in position before use.
- Replace damaged parts immediately.

Caution! This equipment must be operated by qualified persons only.

3. Technical Information

The ANALEXrpd is designed for the separation of metallic particles from oil samples.

3.1 Specification

Measurement Speed	30 – 200 RPM
Presets	4 Adjustable Levels. Factory Preset (70,100,130, 200 RPM)
Ambient Temperature Limits	Stable temperature between +10°C (50°F) and +30°C (86°F)
Size & Weight	370mm x 230mm x 500mm (4.5kg)
Ingress Protection Rating	IP20
Supply Voltage Range	60W 15VDC via 100-240VAC (50/60 Hz) Power Supply

3.2 Part Numbers

The ANALEXrpd is supplied as shown in Section 3.2.1. Spares and accessories are available as shown in section 3.2.2.

3.2.1 Standard Assembly FG-K19026-KW

Description	Notes
ANALEXrpd	Standalone Instrument
User Manual	MA-K19082-KW
Guide to Wear Particle Recognition	MA-K14758-KW
100 Substrate Slides	AS-K27150-KW
4 Rubber Slide Seals	
Sample Pipette	BI-K15025
2 Wash Tips	BI-K15145
Duel Volume Pipette	FG-K15146-KW
Viton® Tubing	
Connector Sleeve	
Solvent Wash Bottle	
Waste Bottle	AS-K15502
Shipping Carton	Retain all original packaging

3.2.2 Consumables FG-K15031-KW

In addition to any items listed previously, ANALEXrpd spares can be ordered using the following part numbers:

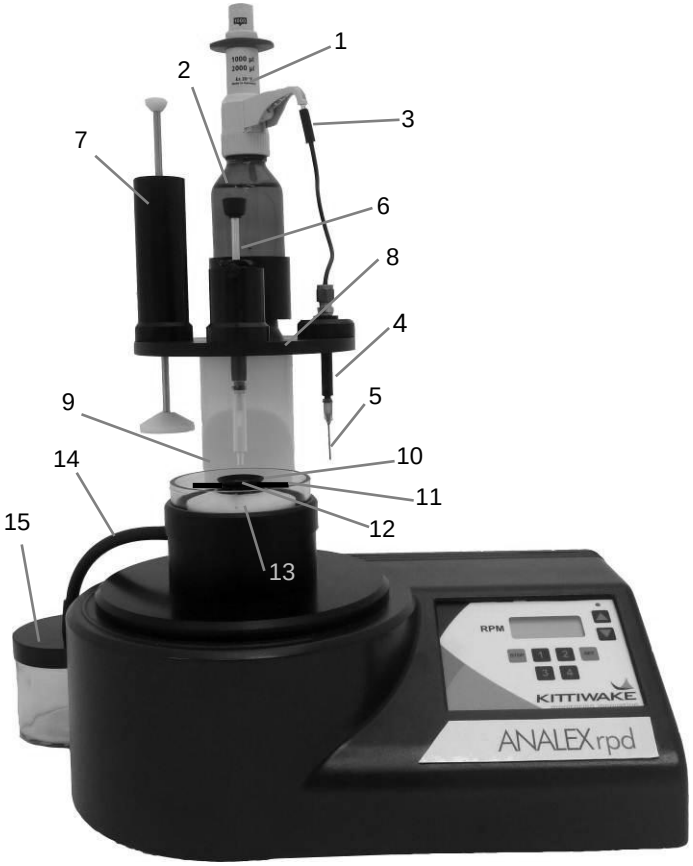
Kittiwake Part No.	Description	Notes
FG-K15031-KW	2 Year RPD Consumable Pack	See below for inclusions
AS-K15445	8 x Rubber Slide Seals	
AS-K27150-KW	10 x Substrate Slide Box	
BI-K15026	100 x Sample Pipette Capillary Tube	
BI-K15027	3 x Sample Pipette Plunger Tips	
BI-K15032	50 x Transparent Slide Cases	
BI-K15602	1m of 6mm ID Viton® Tubing	
BI-K15613	1m of 1.6mm ID Viton® Tubing	

4. Assembling the ANALEXrpd

4.1 Unpacking the Instrument

The RPD comes partly assembled, packaged within a single carton. The package should be inspected for external damage, in which event the carrier/shipper and Kittiwake Developments Ltd should be immediately notified. Upon removing the RPD from its box, check that there is no damage.

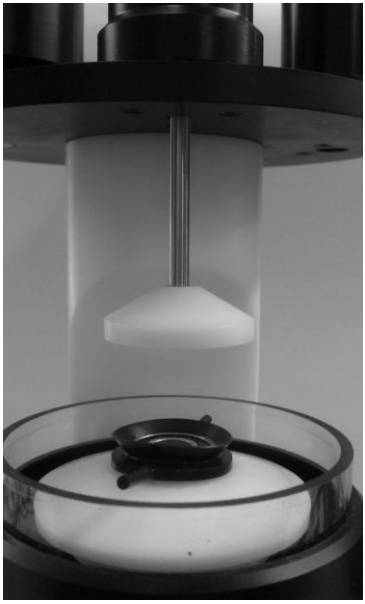
4.2 Features Diagram



Item	Description	Item	Description
1	Wash Solvent Supply Pipette	9	Pedestal
2	Wash Solvent Supply Bottle	10	Suction Seal For Sample Slide
3	Connector Sleeve	11	Slide Release Tag
4	Wash Solvent Directional Pipette	12	Magnet Assembly
5	Wash Solvent Needle	13	Solvent Reservoir
6	Sample Pipette	14	Wash Solvent Drain Tube
7	Slide Plunger		
8	Carousel	15	Wash Solvent Drain Bottle

4.3 Carousel

- Place the RPD on a bench and take the black carousel in both hands.
- Position the carousel over the plastic pedestal such as the bearing is aligned with the hole.



- Push down firmly and the carousel will locate in the correct position with very little effort.
- Rotate the carousel a full 360°, a noticeable click should be heard as each item on the carousel aligns itself with the centre of the magnet assembly.

4.4 Solvent Supply

- Place the wash solvent supply bottle into the bottle holder on the carousel.
- If not already fitted, screw the wash solvent supply pipette to the neck of the bottle and fit a short length of Viton® tube into the connector sleeve and attach to the tubing from the wash sample pipette. Attach the other end to the compression fitting at the top of the wash pipette.

4.5 Solvent Drain Bottle

- Connect the outlet from the solvent drain bottle, using the length of tubing supplied, to the waste solvent drain bottle.

- Place the waste solvent drain bottle next to the RPD base.

4.6 Sample Pipette

The sample pipette should come ready assembled and ready for installation into the carousel. If not, please refer to section 7 of this manual (Cleaning and Maintenance).
Loosen the retaining screw and drop the pipette through, tighten the screw by hand.

5. Installation

5.1 Location

The ANALEXrpd is designed to operate on a flat, level surface such as a workbench or desk.

5.2 Connecting the Power Supply

a) Connect the cable from the supplied power supply to the rear of the unit.

b) Plug the mains lead into the power supply and then into a suitable earthed power socket.

c) Turn on the switch at the power socket.

d) Turn on the power to the unit via the rocker switch on the rear panel.

6. Operating Procedure

6.1 Key Parts of the RPD

Carousel Assembly

The carousel assembly comprises of the following:

Slide Plunger (7)
This is used to press the microscope slide onto the magnet face. It is fitted with a spring for retraction and requires only a light pressure for operation.

Sample Pipette (6)
This is used to withdraw a fixed 1ml sample from the sample bottle. Further instructions on the use of the sample pipette can be found within its packaging.

The Wash Solvent Supply Pipette and Bottle (1,2)
The pipette is used to introduce solvent onto the sample slide in a controlled manner.

Front Panel
The front panel carries a power indicator, current RPM readout and tactile buttons, from which the speed settings are operated.

6.2 Speed Settings

The RPD unit has four adjustable preset spindle rotation speed settings, which are supplied pre-set to the values listed below. Rotation speed values are expressed in revolutions per minute (rpm).

PRESET 1 is supplied set to 70 rpm
PRESET 2 is supplied set to 100 rpm
PRESET 3 is supplied set to 130 rpm
PRESET 4 is supplied set to 200 rpm

These are the speeds normally required for RPD sample preparation, but they can be changed if required as described below. Pressing the STOP button will stop the rotation from any preset or manually adjusted speed.

Preset Adjustment

The four preset spindle rotation speed options may be adjusted as follows:

- Ensure the unit is switched on. The rpm speed indication panel will then be illuminated.
- Begin by adjusting the speed settings of **PRESET 1**. Press 1 to start the spindle rotating at the previously set speed.
- Pressing the up arrow key or the down arrow key will increase or decrease the spindle rotation speed within the range 30-200 rpm.
- Adjust to the speed required and press **SET** to store the value in the selected **PRESET 1** memory.

The above procedure is used to change values for **PRESET 2, 3** and **4.**

6.3 Carousel Operating Procedure

The carousel is manually operated and may be rotated in either direction until it “clicks" into position.

The first position is with the slide plunger (7) located over the magnet assembly. After the slide is fitted (see section below, ‘Slide Preparation’), the carousel is rotated in a clockwise direction until the sample pipette (6) is located over the magnet assembly.

To position the washing pipette (4) over the magnet assembly, the carousel is again rotated in a clockwise direction.

Before preparation of the next slide, rotate the carousel to allow the slide plunger (7) to be positioned over the magnet assembly.

6.4 Slide Preparation

- Warm the sample for about 30 minutes at approximately 60°C. This will increase the fluidity of the sample and also the mobility of any particles within it.

- Position a glass slide centrally on the magnet seal using the slide plunger (7).

- Press the plunger down gently but fully to ensure that the rubber suction seal holds the slide.

- Set the rotation speed to the desired rpm for sample deposition. This would normally be PRESET 1 set at 70 revolutions per minute (rpm) (see section on ‘Speed Settings’). A rotation speed of about 70 rpm has been found to be the optimum for most samples. However, the optimum speed for deposition is dependent upon the viscosity of the sample. A high viscosity sample would require a higher rotation speed for satisfactory dispersal.

- Shake the warmed sample thoroughly to ensure sample homogeneity.

- Withdraw a fixed volume of the sample using the sample pipette (6) and deposit it in a steady droplet flow to the centre of the rotating slide.

- Although sample carry-over is negligible, the sample pipette should be cleaned in readiness for the next sample by filling with solvent and once more depositing the contents at the centre of the rotating slide.

Care should be taken to ensure a representative sample is taken. The wear debris in oil samples is very dependant on the sampling point.

6.4.1 Solvent Dispersion

When the oil sample slide is in position on the magnet assembly and the rotation speed is set, the washing solvent is introduced on to the slide in a controlled manner as follows:

- Using the washing pipette (4), wash with a few millilitres at the rotation speed chosen for sample deposition, i.e. 70 rpm.
- Wash with a further few mls at an increased rotation speed, i.e. 100 rpm.
- Repeat the two procedures above.
- Stop the rotation, and with the slide stationary and covered with solvent, examine the fluid film for signs of any remaining lubricant (brown colouration). If lubricant is still present, repeat the washing sequence until the fluid film is clear.
- When the fluid film is clear, perform the final washing sequence using PRESETS 1, 2 and 3 (up to 130 rpm).
- Dry off the solvent by rotation at 200 rpm, PRESET 4, for a few minutes.

6.4.2 Finished Samples

- Release the slide by gently pulling the tags (11) located on the rubber seal (10).
- Remove the slide and clean the back face using solvent-wetted tissue.
- Identify the slide ready for further analysis (see the accompanying manual ‘Guide to Wear Particle Recognition’).

6.5 General Operating Guidelines

Safety Warning

Please wear eye protection and other appropriate safety equipment when dispensing hazardous liquids. Follow all safety instructions and observe relevant operating procedures. Safe and proper operation is only possible using the recommended dispensing tubes.

- Never use a damaged or deformed dispensing tube or directional pipette tip. Regularly inspect the discharge tube and directional pipette tip for damage. Replace a damaged or deformed tube or directional pipette tip immediately.
- Do not use any other type of discharge tube.
- Never depress the plunger if an obstruction is in place over the outlet.
- The machine should be placed on a level surface.
- Moistening the lip seal with solvent at the commencement of daily operation will ensure proper slide adhesion and prevent the slide springing off the seal during operation.
- For most applications 1ml of sample has been found sufficient. For very clean samples, this may be increased as required.
- The sample pipette may be removed by unscrewing the locking screw in the holder. This will allow the pipette to be used for sampling from non-standard bottles.

Wear appropriate PPE. If in doubt, consult safety officer.

6.5.1 Solvents

The recommended washing solvent is Tetrachloroethylene, Heptane or similar.

Alternative solvents have been used, but may not be as efficient.

- When phosphate ester base lubricants are analysed the washing procedure should be carried out immediately and the rotating head and sample guard also carefully washed.

- It is good practice to empty and rinse the washing pipette (4) after daily use. (please refer to Section 7 or accompanying leaflet for further information)

- The capillaries of the pipettes are easily unscrewed and replaced by hand. Further information can be found in section 7 as well as in the separate information leaflets.

- The slide-retaining lip seal is unlikely to need replacement. If, however, it is damaged in use, it can easily be removed by hand and a new seal fitted.

6.5.2 Wash Pipette Instructions

The user must ensure the compatibility of the wash pipette with the application. The wash solvent pipette is suitable for most liquids, with the exception of solutions of hydrofluoric acid or substances that form crystals or contain or form solids which are catalysed by platinum and iridium alloy.
Inorganic oxidisable solutions may precipitate metallic oxides.

To prime the pipette, place a receiving vessel under the directional tip. Lift and depress the delivery plunger until the solvent dispensed is free of bubbles.

To refill the reservoir, unscrew the wash pipette from the solvent wash bottle.

Avoid twisting the pipette housing. Do not raise or lower the plunger too quickly.

- Check that the wash pipette has not been damaged in transit, then fit to the wash solvent bottle.
- Ensure that the pipette body is firmly fitted onto the solvent bottle.
- Ensure that the dispensing tube is firmly connected and that the directional pipette tip is pointing downward.
- Select the volume required by pushing down on the plunger and turning until the required volume is visible in the display window.

Please clean the pipette daily. Operating temperatures should not exceed 40°C (104°F).

7. Cleaning and Maintenance

7.1 General Cleaning

If aggressive fluids (e.g. phosphate esters) are being analysed, particular care should be taken to avoid contact between the fluid and the ANALEXrpd case.
It is very important to keep the instrument clean, otherwise, a new sample may become contaminated by a previous spilt sample.

To clean, use a damp cloth moistened with a warm detergent solution. Do not use aggressive solvent cleaners as they may damage the surface.

7.1.1 Cleaning the Main Enclosure

Lightly wipe the body of the instrument. Do not scrub as this may damage the paint finish.

7.1.2 Cleaning the Keypad

Any fluids should be removed immediately to avoid staining. Shut down the instrument and lightly wipe the keypad with a cloth.

7.1.3 Wash Pipette

In order to maintain smooth operation and long life, the dispenser must be cleaned on the following occasions:

- Immediately when the plunger becomes sticky.
- When changing the solvent.
- Prior to long term storage.
- Daily after dispensing:
  - Solutions prone to crystallisation
  - Alkaline solutions
  - Organic solvents
  - Inorganic oxidisable solutions

Clean by flushing with distilled water or a laboratory cleaner and flush with alcohol.

Further information can be found within the supplied operating instructions for the wash pipette.

7.1.4 Sample Pipette

The sample pipette should be cleaned between each sample to avoid any carry over from the previous sample. This can be achieved by flushing the sample pipette through with wash solvent. Any residue on the outer surfaces should be wiped off.

7.2 Maintenance

7.2.1 Wash Pipette

The wash pipette may, on occasion need the Viton® tubing replacing both internally and externally.

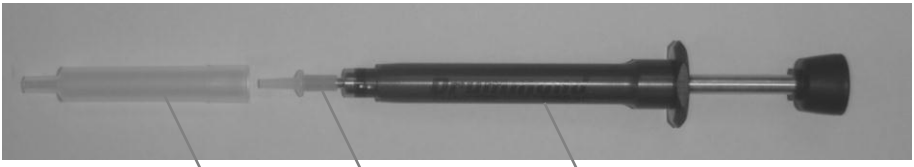
To replace the internal section of pipe, remove the pipette from the bottle and simply pull the pipe off and replace.

To replace the section which leads to the connector sleeve, remove the tube support by sliding upwards, undo the retaining nut and pull tube out. Ensure the sealing washer is removed and placed on the new piece of tube in the correct orientation prior to reinstallation.

7.2.2 Sample Pipette

With time and use the plastic capillary and the plunger tip will need replacing due to wear.

To replace the capillary, hold the capillary in the left hand and rotate the main body toward, two white dots should align. Now simply pull the capillary off.
Do not try to remove the capillary when the white dots are misaligned.



- Replace with a new capillary and reverse the above process in order to secure it.

- To replace the plunger tip, first remove the capillary bore by following the above procedure.

- Cut away the old tip following safe practices at all times.

- Take a new tip and using the supplied holder push the plunger tip until it's fully seated.

- Replace the capillary tube as described previously.

Further information can be found in the supplied instructions for the sample pipette.

8. Troubleshooting

Symptom	Possible cause	Solution
Carousel does not click into position when rotated	Screw in upper right part of pedestal has become loose	Tighten screw clockwise
Carousel does not rotate	Screw in upper right part of pedestal been over tightened	Loosen screw anti clockwise
Slide does not hold on suction seal	Wetting of the seal has not be done to improve suction	Wet the seal with wash solvent
	Suction seal damaged	Replace seal

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