icountACM202024

GB

Aviation Condition Monitoring User Guide

P849792-UK-REV-A

www.parker.com/hfde

Conformity and product markings

CE conformity

The icountACM202024 is in conformity with the protection requirements of the following European Standards in English:

- EN61326, Electrical equipment for measurement, control and laboratory use, EMC requirements.

Defence Standard conformity

The icountACM202024 is in conformity with the test requirements of the following (UK Ministry of Defence) Defence Standard 91–91, Issue 6:

- Turbine Fuel, Aviation Kerosine Type, Jet A-1. NATO Code: F-35, Joint Service Designation: AVTUR (Publication date 8 April 2008, reprinted 25 August 2008).
- The method for testing particle contamination conforms to IP 564 'Determination Of The Level Of Cleanliness Of Aviation Turbine Fuel – Laboratory Automatic Particle Counter Method'.

Markings on the enclosure

The nameplate attached to the rear of the unit provides the name and address of the manufacturer:

Parker Hannifin (UK) Ltd, Filter Division Europe,
Condition Monitoring Centre, Brunel Way,
Thetford, Norfolk, IP24 1HP

Product serial number

The serial number consists of eight digits, for example: **BB84002L**

'**BB**' is the month and year
'**84**' is the product group.
The last three digits are entered sequentially through a month, reverting to '**001**' at the beginning of each month.
'**L**' represents a laser product.

Laser safety

This product contains an invisible infrared 5mW laser.

DANGER – INVISIBLE LASER RADIATION WHEN OPEN. AVOID DIRECT EXPOSURE TO BEAM.

Dismantling of this product is not permitted.

The internal protective housing label, Class 3, which is mounted on the laser module contains the following information:

'This product is a Class I laser product which complies with both USA21 CFR 1040.10 & 1040.11 and (BS) EN 608285-1'

CAUTION: Users are not required to access the laser radiation source and should never do so.

Contents

Introduction

The icountACM202024 Aviation Contamination Monitor from Parker represents the most up-to-date technology in automatic particle counting, and is the first truly portable monitor.

The icountACM202024 has been developed for monitoring contamination in Avtur and other Hydrocarbon fuels, in accordance with the Energy Institute (EI) method IP 564.

The icountACM202024 is a complex instrument, but at the same time has reliability, simplicity and ease of operation designed-in.

This User Guide can show you step-by-step how to get started, how to obtain reliable measurements, and how to interpret the results.

The real benefits to be gained from the icountACM202024 are achieved through regular use, particularly as an effective comparator.

With a typical test taking only two minutes, the icountACM202024 is ideal for use as your standard fluid contamination monitoring instrument.

Above all, the icountACM202024 has been designed for practical use in real-world environments.

Features

Operational features	
Test time	2 minutes, with a repeat test time of every 2 minutes
Principle of operation	Optical scanning analysis and measurement of actual particulates and inference to water presence (as per Clear and Bright methods)
Particle size ranges	4+, 6+, 14+, 21+, 25+ and 30+ microns
ISO code range	7–22
Data entry	32 character two line dot matrix LCD. Full alphanumeric entry facility on keypad.
Data retrieval	Memory access gives test search facility
Communications	Interface via RS-232 connection at 9600 baud rate
Printer	Integral 16-column printer for hard copy output
Calibration	Each unit is individually tested and calibrated by online methods, in accordance with ISO procedures.
Max. working pressure	420 bar
Max. flow rate	380 l/min when used with System 20 Sensors.
Memory capacity	300 test (scrolling memory) capacity
Computer compatibility	Interface via RS232 connection @ 9600 baud rate
Portability	Weighs 6.5kg, including the built-in battery
Power requirement	12Vdc supplied by rechargeable or replaceable battery module
System connection	Via System 20 Inline Sensors
Leak-free sampling	System 20 Sensors ensure sealed fluid extraction and no contamination ingress
Certification	This product complies with all relevant EC declarations of conformity.
Fail-safe features	
Special diagnostics are incorporated into the icountACM202024 microprocessor control to ensure effective testing.	
Circuitry	Incorporates an internal diagnostic programme to ensure integrity of results
Adequate flow	Flow test facility ensures adequate flow
Data management	
The specially designed ParSmart Downloader software package is supplied to facilitate the downloading of test results to a computer.	

Benefits

- Routine contamination monitoring of fuel systems with the icountACM202024 saves time and saves money.
- icountACM202024 saves on downtime – contamination monitoring is now possible while machinery is working.
- Instant, accurate results are available to international standards, so that system maintenance decisions can be taken immediately.
- icountACM202024 ensures that aviation fuel systems are tested to ISO cleanliness standards.
- Data entry allows individual equipment test log details to be recorded.
- Easy review of up to 300 test results via handset display.
- User-friendly instrument makes testing easy for service and maintenance personnel.
- Manufactured from lightweight ABS expanded structural foam which is both durable and strong and supplied in an Astraboard carrying case, the icountACM202024 is easy-to-use in the field or the laboratory.
- Data may be downloaded to a compatible computer for archiving or further analysis.
- Internal diagnostics ensure accuracy and reliability.
- Automatic reminder for recalibration.
- In accordance with the test method IP 564, the icountACM202024 has been included in DEF STAN 91-91 Jet Fuel Specification as a ‘report only’ test, together with the current Gravimetric test method (IP 423 or ASTM D5452) and the Clear and Bright Visual test method (IP 216 or ASTM D2276).

Kit contents

- icountACM202024 Fuel quality monitor
- 12Vdc battery charging unit and mains cable
- Sampling pipes (3m inlet +1m waste)
- Blanking caps (P1/P2)
- Limit output plug.

Fuel cleanliness and contamination

Contamination basics

Solid contaminants in fluid systems vary in size, shape and quantity. The most damaging contaminants in fuel systems are normally between 6 and 14 microns (and therefore invisible to the naked eye).

The table below gives an indication of the relative sizes of common objects.

Object	Typical Size
Grain of table salt	100µm
Diameter of human hair	70µm
Limit of human visibility (naked eye)	40µm
Milled flour	25µm
Red blood cells	8µm
Bacteria	2µm

NOTE: One micron (µm) equals one thousandth of a millimetre (1µm = 0.001mm).

The ISO code

The ISO4406 code is the preferred method of reporting quantity of contaminants in a fluid. It is comprised of three numbers i.e. XX / YY / ZZ, where:

- XX is the scale number for particles larger than 4µm(c) per millilitre of fluid
- YY is the scale number for particles larger than 6µm(c) per millilitre of fluid
- ZZ is the scale number for particles larger than 14µm(c) per millilitre of fluid

By definition the three scale numbers will always decrease, i.e. XX > YY > ZZ.

The following table is extracted from ISO4406:1999 and defines the range of particles that each scale number represents.

For example code 20/18/13 indicates that:

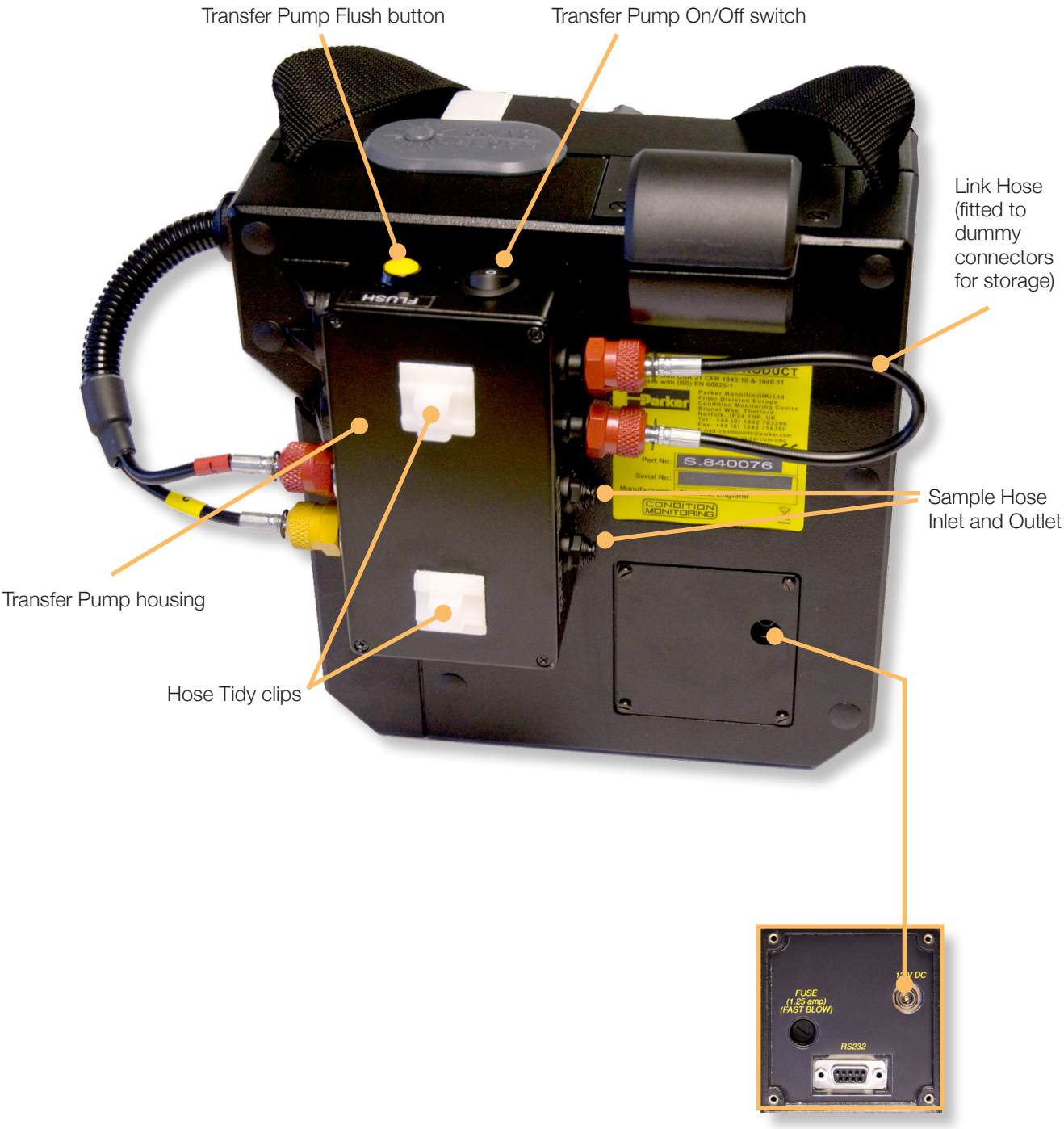
- There are between 5,000 and 10,000 particles per millilitre larger than 4µm(c) (i.e. scale number 20).
- Between 1,300 and 2,500 particles per millilitre larger than 6µm(c) (i.e. scale number 18).
- Between 40 and 80 particles per millilitre larger than 14µm(c) (i.e. scale number 13).

Each increment of scale number represents an approximate doubling in the quantity of particles in a fluid. In practical tests, results obtained can flick between one scale number and the next if the actual number of particles counted is close to the crossover point. Conversely, results that are one scale number different could also indicate nearly four times difference in dirt levels (if the actual particle count on one result is close to the lower limit of one scale number, and the other result is close to the upper limit of the next scale number).

ISO4406 scale number	Number of particles per ml	
	More than	Up to and including
22	20,000	40,000
21	10,000	20,000
20	5,000	10,000
19	2,500	5,000
18	1,300	2,500
17	640	1,300
16	320	640
15	160	320
14	80	160
13	40	80
12	20	40
11	10	20
10	5	10
9	2.5	5
8	1.3	2.5
7	0.64	1.3

icountACM202024 – front view

icountACM202024 – rear view



Input Power Socket (note that you may have to remove the plastic dust cap to access the 12Vdc power socket).

A fast blow 1.25A fuse and the RS232 connection are located behind the removable cover plate. The RS232 interface is provided to download all test data stored in the instrument. See the **ParSmart Downloader** software for more information.

Handset


ISO 4406
Size Code Count
>4µ(c) 19 2688.1
>6µ(c) 16 626.0
14 115.0
>21µ(c) 13 51.1
24.4
>30µ(c) 10 9.9
MODE PRINT 3 Test Print
Liquid crystal display
Micron sizes
ISO Code
Count
Change mode
Print result
Set display
Paper feed
Average 3Test feature
Alphanumeric keys
0
ABC 1
DEF 2
GHI 3
JKL 4
MNO 5
PQR 6
STU 7
VWX 8
YZ- 9

Powering the icountACM202024

The icountACM202024 may be powered via:

- the re-chargeable battery pack. This is supplied as an accessory with its battery charger – see page 31.
- the replaceable battery pack. The battery compartment requires six LR20 ALKALINE batteries. LR20 batteries are readily available and are also known as Type D or 13A batteries.

Using the rechargeable battery pack

Step

1 Fully loosen the two retained screws and remove the rechargeable battery compartment.

2 To charge the unit, attach the flying lead of the 12Vdc supply to the input power socket of the rechargeable battery pack.

Attach the 3-pin plug to a mains socket and switch on.

The red LED flashes to indicate that the unit is charging.

3 When fully charged, the red LED remains steadily on.

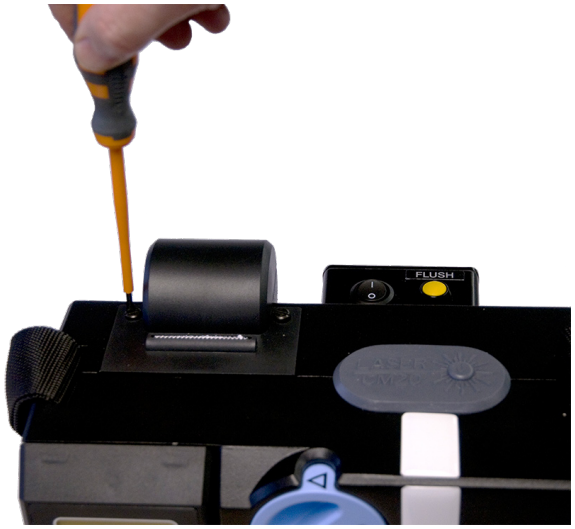
Disconnect the 12Vdc supply and replace the battery compartment.

NOTE: Avoid keeping the battery pack in a discharged state. If the equipment is not to be used for a time, make sure the battery pack is fully charged before it is stored away.

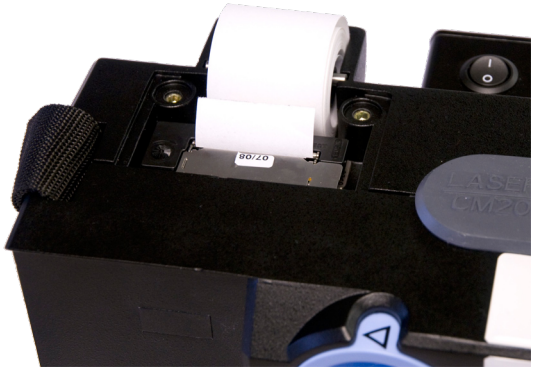
Using replaceable batteries

Step		
1	Remove the battery compartment	 
2	Take note of the diagram on the underside of the battery pack. This shows which way up the batteries need to be in the pack (i.e. the polarity of the batteries)	
3	Insert a complete set of fresh batteries in the sequence shown. The first two batteries are facing down: the next four batteries face up.	   
4	Replace the battery compartment	 

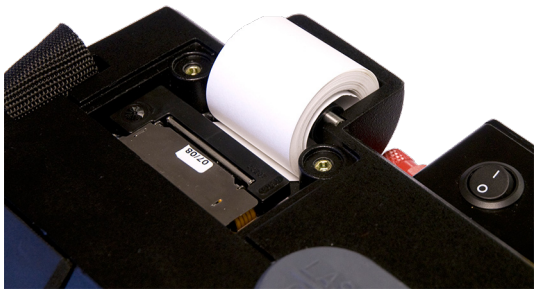
Installing paper and ribbon into the printer

Step		
1	Unscrew the two retaining screws and remove the printer cover and reel axle.	
2	Place the new or replacement ribbon cassette in the printer. Press down until the cassette is sitting squarely, checking that the ribbon is not twisted.	
3	Feed the end of the paper reel under the printer cassette and printer roller.	

4 Press the paper feed button on the hand-held unit until the paper appears through the printer's paper feed slot.

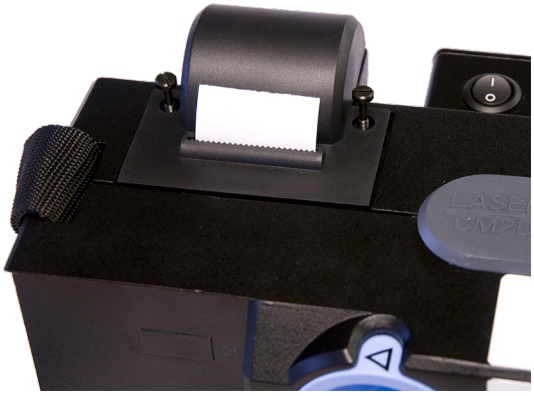


5 Place the paper roll in the paper well. Check that the metal reel axle is correctly aligned in the slots.



6 Feed the paper through the the paper slot in the cover (using the paper feed button on the hand-held unit).

Refit the cover to the icountACM202024 by fastening the two screws.



Preparation and guidelines for testing

Sampling methods

The icountACM202024 is capable of sampling fluid in two ways:

1. **Online indirect**. This refers to sampling directly from a body of fluid in the system at atmospheric pressure (e.g. a tank). The system may be running or not.
2. **Offline**. This refers to the method of taking a sample in a sample bottle and then performing a test either immediately or at some time later from the sample bottle.

It is important to be aware of differences that can arise from these two sampling methods

General guidelines

The following guidelines summarise best practice in order to guarantee accurate, repeatable results, and should be adhered to for all fluid sampling using the icountACM202024.

- Handle the icountACM202024 with care; it is a precise instrumentation product.
- Ensure hoses and sampling pipes are fitted and where applicable tightened correctly.
- Replace the sampling pipes regularly.
- Cap the ends of sampling pipes after use to prevent dirt ingress.
- When sampling from fuel tanks keep the pipe inlet away from the sides or bottom of the tank to ensure you are sampling the main body of the fuel.
- Discard all waste fluid – do not recycle any fluid once it has been through the icountACM202024
- Use consistent sampling methods
- For trend monitoring, ensure samples are taken under similar working conditions
- Re-calibrate the unit annually.

CAUTION!
Only turn the valve when starting a test and only when the valve turn symbol (⊘ or ⊘) is shown on the display, or % by volume, or ISO4406 (all channels) screens are displayed.

3m of inlet sample pipe is provided. This should be cut down to the minimum convenient length for sampling (this will prolong battery life and reduce the risk of dirt build-up along the length of pipe).

Specific guidelines for Method 1 (Online indirect)

When sampling using method 1 it is better if the system is running as this will agitate the fluid. If the fluid is static, sample results may depend on the exact position of the inlet pipe, due to settling.

In some cases this may not be possible, and so consistent methods should be used.

Specific guidelines for Method 2 (Offline)

For full details of the preferred testing method, please refer to the UK's Energy Institute (EI) test method IP564 ('IP 564 Determination of the level of cleanliness of aviation turbine fuel — Laboratory automatic particle counter method', available from www.energyinstpubs.org.uk).

CLEANING SAMPLE BOTTLES

Bottles used for sampling must be cleaned prior to use. This is best done using the fluid to be sampled, as follows:

1. Fill the bottle a half to two-thirds with fluid.
2. Screw the cap on and then shake vigorously for 30 seconds.
3. Uncap and drain the bottle.
4. Repeat steps 1 to 3 two further times (i.e. a total of three times).
5. The sample bottle is now ready for use.

PRIOR TO TESTING

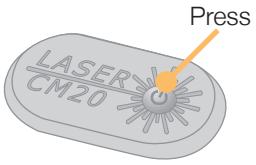
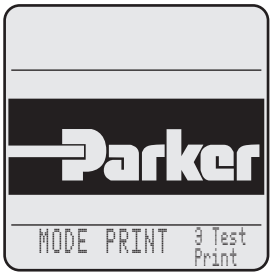
Prior to any testing of any bottled fluid (including verification fluid), the fluid should be gently agitated to ensure a good mix. This is best done by slowly tumbling the bottle end over end at a tilted angle for about 60 seconds, as shown below.

DO NOT SHAKE the fluid sample at this stage as this will introduce air in the fluid and lead to poor results. A gentle tumbling action is required.

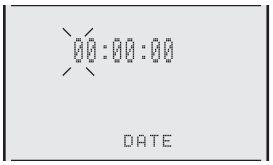
Setting the time and date

Before running any tests, you should make sure that the icountACM202024 has the correct time and date set. This allows any Automatic tests to be started at the correct time, and ensures that printouts have the correct time and date of testing as part of the record.

Setting the time-of-day

Step		
1	Switch on the icountACM202024	
2	Remove the handset and check that the start-up screen is displayed.	
3	Press and hold –MODE for five seconds. RESET DATA Y/N? is shown on the display. To clear all stored test results from the icountACM202024 memory, press ◀ to move the cursor under Y and press –MODE. If you do not wish to clear the icountACM202024 memory, check that the cursor is under N (press ▶ if it isn't) and press –MODE.	
4	The time entry screen is displayed with the first digit shown blinking.	
5	Enter the correct time from the numeric keypad, using the four figure HH:MM format. The 24-hour clock convention is used. For example, to enter 9:30 am: Press 0 9 3 0.	
6	If you make a mistake, simply key the time in again, overtyping the previous entry. When the time is shown correctly, press –MODE to confirm.	

Setting the date

Step		
1	When you have confirmed the time by pressing MODE, the date entry screen is displayed with the first digit shown blinking.	
2	Enter the correct date from the numeric keypad, using the six figure DD:MM:YY format. For example, to enter the date 21st August 2009: Press 2 1 0 8 0 9	
3	If you make a mistake, simply key the date in again, overtyping the previous entry. When the correct date is displayed, press MODE to confirm.	

Screen adjustments

The screen brightness can be adjusted and it has a backlight. These are controlled as follows:

BRIGHTNESS

Press and hold 5 and use ◀ to make the screen brighter.

Press and hold 5 and use ▶ to make the screen darker.

Press ◀ and ▶ together to save the current brightness settings, via a 'Save Screen' option.

BACKLIGHT

Press and hold 7 and use ◀ to switch the backlight on.

Press and hold 7 and use ▶ to switch the backlight off.

NOTE: When the icountACM202024 is switched off the backlight and contrast functions are reset. Therefore if the backlight is still required when the icountACM202024 is switched back on, the backlight will then need to be reactivated. This is to preserve battery life.

Operation

Once the icountACM202024 has been set up, it is ready to check fluid cleanliness levels.

NOTE: The icountACM202024 contains aviation fuel and may need to be flushed prior to use.

Connecting sampling hoses

Connect the sample hoses to the 'INLET' and 'OUTLET' connections. These are push-fit connections.

To remove the blanking plugs (or the hoses) from the fitting, push both the plug/hose and the outer ring (arrowed) towards the fitting. Then, while keeping the ring pushed in, gently pull the plug/hose to withdraw.

To fit a hose or plug, push into the fitting until the seal resistance is overcome.

Priming the transfer pump

To avoid large volumes of air passing through the ACM unit, which can give incorrect readings, the transfer pump should be primed before use. To do this, disconnect the hoses to the main unit from P1/P2 on the transfer pump unit and connect the link hose in their place. Put the inlet hose into the fluid and run the pump until fluid comes out of the outlet hose.

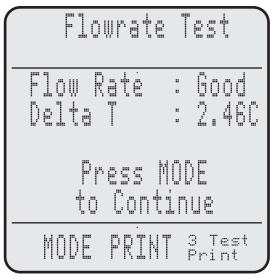
NOTE: When connecting P1 and P2, take care to align the central tube with the fitting and only screw on finger-tight.

NOTE: Press and hold down the 'FLUSH' button to speed up the pump. (The FLUSH button should only be used during priming/flushing and not during a test).

Once the pump and tubing are primed with the test fluid the hoses from the ACM can be reconnected. It is then recommended to run a minimum of four tests, discarding the first test result, as this may be a mixed result with previous fluid from the ACM.

Testing procedure

Flow check

Step		
1	Place the inlet pipe in the fluid to be sampled, and place the outlet pipe into a suitable waste container.	
2	Switch on the icountACM202024 and switch on the transfer pump..	
3	Wait until the fluid has been drawn through the icountACM202024 and starts coming out of the outlet pipe.	
4	Press and hold the ◀ key for two seconds to start the flow test. This is a self-check to confirm that there is sufficient flow to carry out a test.	
5	After 30 seconds the flow test is completed and the handset displays the results: Press ● MODE to continue.	

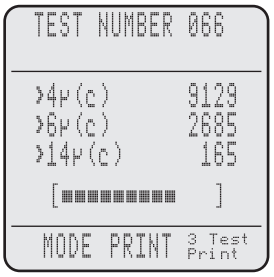
NOTE: A ΔT (temperature difference) of less than 3.6°C is required for a successful test to be achieved. If the ΔT value is greater than 3.6°C, then refer to the checks for low flow (Diagnostic 5 in 'Troubleshooting') in the Maintenance section.

Sample test

When the flow test has passed, you are ready to start a test.

Step	
1	Note the position of the main valve switch, ⊘ or ⊘.
2	Turn the valve switch 90° in the direction indicated.

CAUTION!
Only turn the valve when starting a test and only when the valve turn symbol (⊘ or ⊘) is shown on the display, or % by volume, or ISO4406 (all channels) screens are displayed.

3	Testing starts immediately and takes approximately two minutes. The progress of the test is shown by the bar at the bottom of the screen. During each test, the test number is shown at the top of the screen (the example screen shows test number 066 in progress). During all tests an interim count for 4µ(c), 6 µ(c) and 14µ(c) particle ranges is displayed.	

NOTE: The '(c)' after the size indicates that the icountACM202024 has been calibrated according to ISO11171:1999, Hydraulic Fluid Power – Calibration of automatic particle counters for liquids.

Entering a Serial number ('ID code') for the test

NOTE: The units are pre-configured with a test ID of 'icountACM202024 Unit Serial Number'. Any change to the ID applies from the next test onwards.

A 32-character reference (ID) can be stored with each test. To enter this reference:

Step	
1	From power on press MODE three times to step through the count modes to the serial number entry mode.
2	The previous identification code, if any, is displayed.
3	Use the ◀ ▶ keys to move the cursor to the character to be edited, then use the alphanumeric keys to change the character (press the key repeatedly to click through the characters available for each key).
4	Press ◀ to delete the previous character if a mistake has been made.
5	Once the ID is complete, turn the main valve switch to start a test. The ID is entered into the icountACM202024's memory and the test starts.

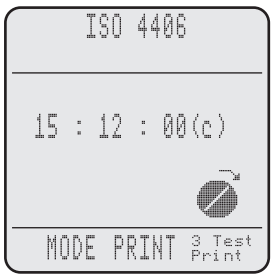
Viewing test results

Reviewing and printing results

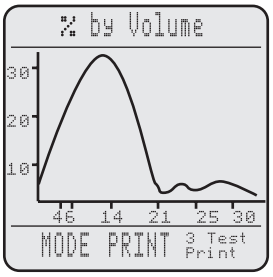
When the test is complete, results are shown in one of the four screens shown.

Use the ◀ ▶ keys to scroll through the result screens, and press PRINT to print out the screen displayed. The printout also shows the date, time, test number and ID Code.

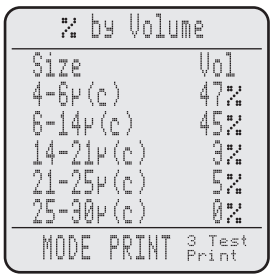
1. ISO Code



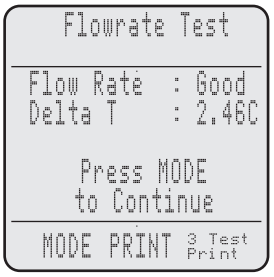
2. % by Volume (graph)



3. % by Volume (details)



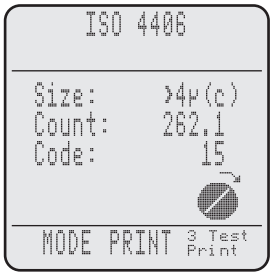
4. Flowrate



When in the ISO Code screen, press MODE to obtain the actual particle count results.

Individual screens give the count and ISO code for each particle size range; use the ◀ ▶ keys to scroll through each screen.

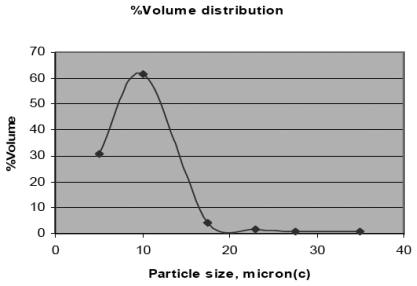
Press PRINT for a printout of the ISO count results. To print all tests to date, press the PRINT button twice. Printing is stopped by pressing a third time.

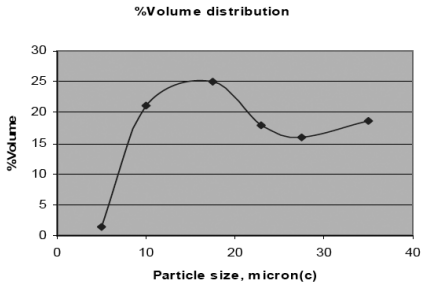


NOTE: The minimum and maximum ISO codes that can be measured are 7 and 22 respectively. If the result is below 7 then '0' is displayed; if the result is above 22 then '99' is displayed.

Interpreting results

The graph shown above, and below (left) is typical of a normal fluid with some level of solid contamination. If the fluid is non-homogenous e.g. there is water or air present in solution, then the graph will show a 'kick' at the tail end, as shown on the right.





Retrieving earlier test results

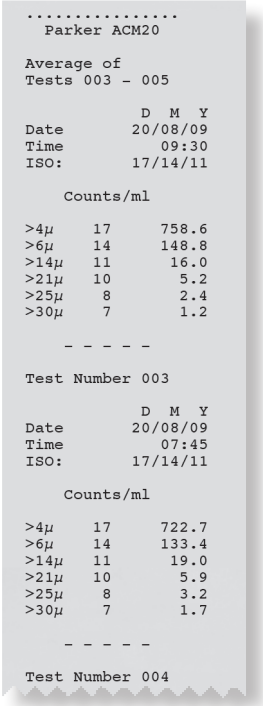
Previous test results can be retrieved either by Test number or by Serial number (the 32-character ID code).

Step		
1	Press and hold ABC 1 for two seconds.	
2	Press ◀ to select 'Y'. Press –MODE to confirm.	DATA RETRIEVAL- Y/N?
3	Select 'S' to retrieve by Serial number (ID code), or 'T' to retrieve by Test number. Press –MODE to confirm.	SERIAL OR TEST NUMBER- S/T?
4	Use the alphanumeric keys to enter the Test number or Serial number (ID code), then press –MODE to confirm. When the test results are displayed, you can scroll through the result screens and print as normal.	
5	To exit the result retrieval facility, press –MODE. The following message appears: To view and print more results, select 'Y'. To return to the standby screen select 'N'.	RETRIEVE MORE RESULTS Y/N?

3Test printout

The 3Test printout provides a quick method to print the results of the last three tests held in memory, together with an average value for the particle counts.

The feature is useful if you need to check the repeatability of results taken from the same fuel sample. Note that there must be at least three tests in the icountACM202024's memory for the 3Test feature to work.

Step		
1	Press ●–3Test Print to access this print feature.	
2	An average of the last three readings is printed, followed by the individual results of the last three tests. *NOTE: Three tests must be in memory for the 3Test Printout function to work.* *The handset beeps three times if less than three tests are held in memory.*	

```
.................
  Parker ACM20

Average of
Tests 003 - 005

              D  M  Y
Date       20/08/09
Time          09:30
ISO:       17/14/11

    Counts/ml

>4µ    17      758.6
>6µ    14      148.8
>14µ   11       16.0
>21µ   10        5.2
>25µ    8        2.4
>30µ    7        1.2

    - - - - -

Test Number 003

              D  M  Y
Date       20/08/09
Time          07:45
ISO:       17/14/11

    Counts/ml

>4µ    17      722.7
>6µ    14      133.4
>14µ   11       19.0
>21µ   10        5.9
>25µ    8        3.2
>30µ    7        1.7

    - - - - -

Test Number 004
```

Trend analysis printout

A trend analysis over a number of tests can be obtained.

The test range can be selected by test number or by serial number (ID code).

Step		
1	Press and hold DEF 2 for two seconds.	
2	Press ◀ ▶ to select 'Y', then press ●–MODE to confirm.	TREND PRINTOUT Y/N?
3	Select 'S' to retrieve by Serial number (ID code), or 'T' to retrieve by Test number, then press ●–MODE to confirm.	SERIAL OR TEST NUMBER- S/T?

	SELECTING BY TEST NUMBER		SELECTING BY SERIAL NUMBER	
4	Enter the first and last Test numbers to be analysed. Press ●–MODE to confirm each entry.	ENTER FIRST TEST NUMBER: _ ENTER LAST TEST NUMBER: _	Enter the Serial number (ID code) of the tests to be analysed. Press ●–MODE to confirm each entry.	PLEASE ENTER A TEST ID CODE: _

5	Press ●–MODE to begin the trend analysis printout. Note that: ■ graphs print down the page rather than across. ■ adjacent points on the graph are joined by a continuous line. ■ printouts for 4, 6 and 14 micron in ISO show separate graphs for each particle size. ■ a maximum of 30 graphs may be printed per session.	GENERATING TREND PLEASE WAIT… MODE PRINT 3 Test Print
6	To print more graphs, select 'Y', or to return to the idle screen select 'N'.	PRINT MORE TRENDS Y/N?

Clearing test results

NOTE: This function permanently deletes all stored results, so it should be used with care.

Step		
1	Press and hold ●–MODE for five seconds. The following message appears:	RESET DATA Y/N?
2	Selecting 'Y' clears all test results from the memory. Selecting 'N' (the default) proceeds to the time/date setting – see pages 16–17.	

Automatic testing

Step		
1	To access automatic testing, press and hold JKL 4 for 2 seconds.	
2	Press ◀ to select Y, then press —MODE to confirm.	AUTOMATIC TESTING Y/N?
3	Enter the start time via the handset, then press —MODE.	ENTER TEST START TIME: 13:40
4	Enter the interval (minutes) between each test start time.	TEST INTERVAL (6-999 min):
5	Enter the number of tests to be performed (range 1 to 300 tests).	ENTER NUMBER OF TESTS TO RUN:
6	Select 'Y' if a printout of each test is required, then press —MODE.	PRINT RESULTS Y/N?
7	Press ◀ to select 'Y', then press —MODE.	START TESTING Y/N?
8	Testing starts at the each chosen time. Pressing —MODE ends the automatic test sequence and returns the icountACM202024 to its idle state.	AUTOMATIC TESTING TIME NOW: 14:54 START AT: 14:55 PRESS MODE TO ABORT MODE PRINT 3 Test Print
9	The test chamber is flushed before the first test starts.	TEST NUMBER 020 FLUSHING
10	Counting starts, with interim counts displayed.	TEST NUMBER 020 COUNTING
11	The user is notified when all the tests are complete. Press —MODE to return to the idle screen.	AUTOMATIC TESTING COMPLETE

Alarm facility and limit levels

ALARM LEVELS

The icountACM202024 has the facility to trigger an alarm if the sample tested exceeds preset limits.

NOTE: Limit levels are set at 99 (maximum) at the factory.

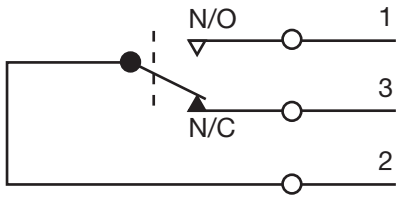
Step		
1	Press 9 for two seconds.	EDIT ALARM LEVEL Y/N?
2	Press ◀ to select Y, then press MODE to confirm.	EDIT ALARM LEVEL Y/N?
3	Enter the 4µm code level you do not wish to exceed, then press MODE to confirm. Repeat this for the 6µm and 14µm code levels.	4µ(c) LIMIT: 21
4	Once the three levels are set, the display shows:	LIMIT LEVELS SET
5	If any of the preset alarm levels are triggered during a manual or automatic test, an output signal is sent and the alarm sounds (manual test only) and 'Alarm' flashes on the display. Any external device connected is also activated. If an alarm is sounding after a test then: Press and hold 0 and use ◀ to silence the alarm. Press and hold 0 and use ▶ to 'snooze' the alarm for five minutes.	% by Volume Alarm MODE PRINT 3 Test Print

LIMIT SWITCH OUTPUT WIRING

NOTE: The user is responsible for selecting the appropriately rated cable for the externally controlled device.

The limit switch output (see socket wiring diagram) can be wired as either **normally open** (N/O) or **normally closed** (N/C) using the supplied limit output plug. This switches an external device if an alarm level is exceeded.

Contact Rating = 5A @ 220V AC or DC



AUDIBLE ALARM ENABLE/DISABLE

NOTE: The audible alarm defaults to ON when the icountACM202024 is turned off.

Step		
1	Press and hold 6 for two seconds.	
2	Select 'Y' or 'N' to enable or disable the audible alarm, then press MODE to confirm.	AUDIBLE ALARM Y/N?

LEVEL TESTING

Step		
1	Press GHI 3 for two seconds.	
2	Press ◀ to select 'Y', then press MODE to confirm. The unit then asks if the level (i.e. limit) testing is continuous or not. If yes, the unit runs indefinitely whether the levels have been triggered or not. If no, the unit runs tests until the level is triggered and then stops. Please see the 'Automatic Testing' section for details of set up.	LEVEL TESTING Y/N? AUDIBLE ALARM Y/N?

LIMIT SWITCH RELAY – MANUAL CONTROL

To energise the level testing relay module before running a test

Step		
1	Press and hold PQR 6 for two seconds.	
2	Press ◀ to select 'Y', then press MODE to confirm. Selecting "Y" manually energises the level testing relay module (i.e. makes contact between pin 1 and 2 of the level testing relay module).	LIMIT SWITCH RELAY ON Y/N? LIMIT SWITCH RELAY ON Y/N?

Operation checklist

Always ensure:

- the sample analysis method given in IP564 (reference on page 15) is followed
- that sensors are installed correctly
- that sensor connectors are correctly tightened
- there is adequate fuel flow
- fuel sample bottles are rotated (see page 15) to distribute contaminants evenly prior to analysis.
- there are no dramatic fluctuations in pressure within and between tests
- trend monitoring is performed under similar working conditions
- hoses are correctly stowed to avoid fuel spillage
- icountACM202024 is handled with care – it is an instrumentation product
- that you keep a good stock of spares, and reorder in advance
- the icountACM202024 is calibrated according to Parker recommendations.

NOTES:
Take care not to run the pump dry for extended periods.
Large contaminant particles should be removed prior to testing: they could damage the pump.

Maintenance

Cleaning/flushing the transfer pump

After using the icountACM202024 and pump have been used with thick fluids, you should flush the pump through with an alcohol-based product. This will prevent the pump from seizing next time it is used.

Connect the link hose to ‘P1’ and ‘P2’ of the transfer pump, put the inlet hose into the alcohol fluid, and then run the pump for approximately one minute.

After one minute, remove the inlet hose from the alcohol and run the pump to draw air through the system and evacuate the alcohol.

NOTE: The pump can be left dry for periods of time as long as you flush it prior to use with a cleaning fluid, or as per recommendations in IP 564.

Calibration

When switching the unit on, it will check the date as stored in the real-time clock against the date stored as the next calibration due date. Parker recommends the icountACM202024 is calibrated annually in accordance with ISO procedures. For your nearest service centre contact your local Parker Hannifin sales contact or visit www.parkerhfde.com/condition/service/

If the date is within four weeks of the calibration due date, then the following message is displayed when the unit is switched on:

(The example above is for a calibration due date of 22 February 2010)

To ignore the message for now and continue with testing, press MODE.

If the unit passes the calibration due date, the following message is displayed when the unit is switched on:

To ignore the message for now and continue with testing, press MODE.

To comply with IP564 recommendations, a verification test should be carried out no later than six months from the main calibration.

Troubleshooting

CAUTION: The icountACM202024 is a precise instrumentation product. Users should not attempt to open the main unit for any reason. If the checks listed in this section do not solve a problem, the unit should be returned to Parker Hannifin for repair.

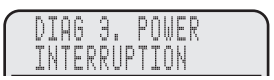
Low battery warning

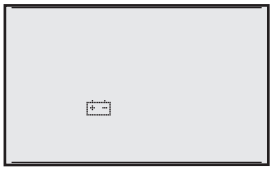
The following icon on the screen indicates low battery power:

Replace the batteries as soon as possible. The icountACM202024 will not complete a measurement if the power is insufficient.

Error codes/messages

The following table details error codes that may be seen and outlines the checks to carry out. For anything not covered here, or if the checks listed do not solve the problem, contact Parker.

Code	Reason	Checks
DIAGNOSTIC 1A  1A. At beginning of test (the first two segments showing)	Fuel is too dark or it is cloudy.	Check sample of fuel visually. This can be done as follows: **Dark fuels**: Wet your thumb and forefinger in the fuel and press together. Release and look at your thumb. If you can see through the film of fuel it should work in the icountACM202024. If you cannot, then you may have problems. **Emulsions**: Put sample in a clear container and hold up to the light. This will show cloudy or clear. If cloudy, check the type of fuel and change until the fuel is clean. Then retry icountACM202024.
DIAGNOSTIC 1B  1B. at the end of the test	Unstable fluid opacity may be caused by aeration, water sludge or an amount of cold fuel passing through icountACM202024	Allow machine to work up to operating temperature before performing condition monitoring. Run tests with a stable system and ensure that a minimum line pressure of 2 bar is available at the monitor to reduce the possibility of aeration.
DIAGNOSTIC 2  The changeover valve and syringe pump are out of phase	a. Control knob turned, either before monitor switched on, before valve symbol displayed on handset or during a test b. Time taken to turn valve fully to next position is too long (20 seconds) c. Microswitch setting fault.	a. Switch off the monitor, then switch on and wait for monitor to reset its position (diagnostic screen 6 is displayed). Start next test when valve symbol is displayed on handset. b. Return to Parker Hannifin for repair c. Return to Parker Hannifin for repair.
DIAGNOSTIC 3  Uncontrolled power down	a. Battery power too low. Battery level warning ignored b. Internal electrical fault	a. Charge the unit (outside the hazardous area) b. Return to Parker Hannifin for repair

DIAGNOSTIC 4  Insufficient flow rate of fuel from P1 hose into monitor block to fill syringe pump. Results are suspect and not made available.	a. Inadequate differential pressure across P1 and P2 connections to provide sufficient bypass flow. b. Air lock in monitor block or blockage in bypass hoses.	a. Select smaller sized sensor b. Use a Single Point Sampler connected to P1 (see the Parker Hannifin catalogue for details). Purge by using system pressure with P2 hose disconnected from system.
DIAGNOSTIC 5   Test time too short or too long. Results are suspect and are not made available.	a. Malfunction of Opto-Tacho control, causing flow to stop before particle counting phase completed. Pump drive slipping or failed. b. DP (Differential Pressure) too high due to lack of control of flow through icountACM202024.	a. Care should be taken to allow fuel to discharge safely and should only be performed by a competent operator. Re-test and if fault reoccurs, return the unit to Parker Hannifin for repair. b. Use SPS (Single Point Sampler) or sensor to control flow through icountACM202024.
DIAGNOSTIC 6  Unit trying to reset from last error	Displayed after switching on, while monitor is resetting itself from the previous error condition.	Leave the unit alone until it has reset. If it does not reset, or switches itself off, contact Parker Hannifin.
DIAGNOSTIC 7 AND ABOVE   	These are faults which can only be rectified by Parker Hannifin and are normally software related.	
	Displayed if the monitor block has reached a temperature above 60°C.	Remove icountACM202024 from system connections. Allow to cool down. If unit does not reset, contact Parker Hannifin.
LOW BATTERY 	Recharge battery pack or replace batteries (see pages 11–12). The icountACM202024 will not complete a measurement if power is insufficient.	

Spares and accessories

Part number	Description	Qty
B84794	1m process cable assembly	
B84816	Parsmart downloader software	
P843855	Carry case	
B84746	Bottle assembly	
B84745	Online throttle kit assembly	
B84645	Online millipore adaptor assembly	
B84609	Rechargeable battery pack	
B84817	UK power supply	
B84830	US power supply	
B84831	Euro power supply	

Rechargeable battery pack

Type	NiMH (Nickel Metal Hydride)
Charging conditions	Via supplied charger only.
Temperature range	Storage: –20 to 35°C Discharge operation: –20 to 50°C Fast charge: 10 to 45°C Other charge: 0 to 45°C
Life expectancy	>500 cycles (IEC standard) before a gradual loss of capacity. It is recommended that the battery undergoes a full discharge/charge cycle every three months.
Shelf life	Three years

Reference

Interpreting data

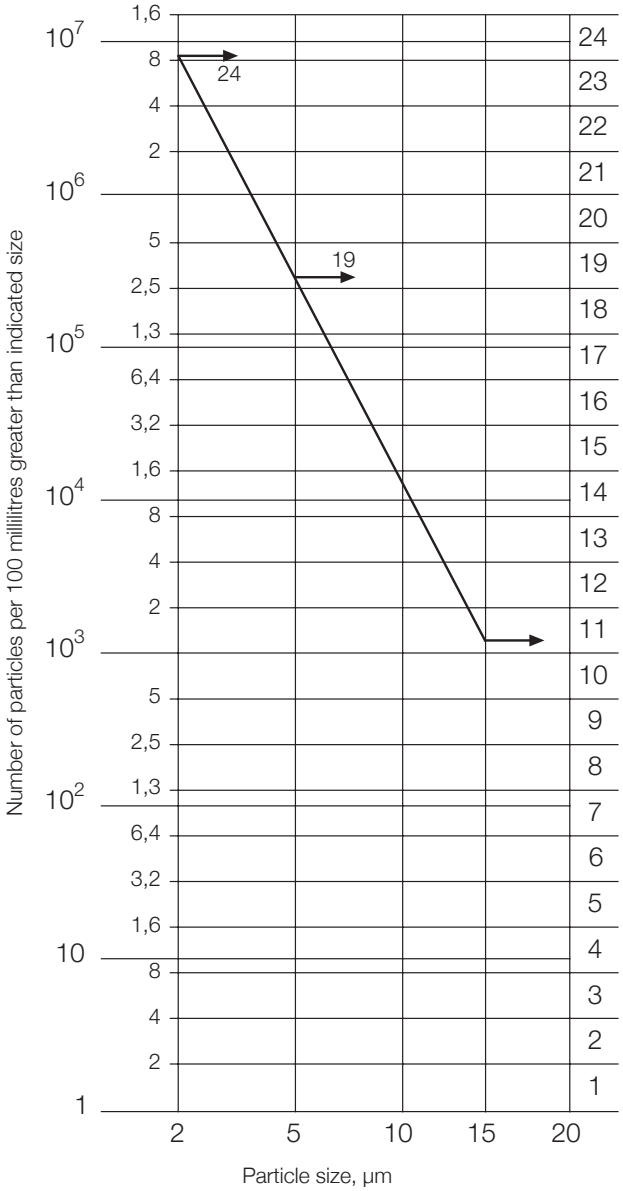
Solid contaminants in aviation fuel systems vary in size, shape, form and quantity. The most harmful contaminants are normally between 6 microns and 14 microns. The ISO code is the preferred method of reporting quantity of contaminants.

The ISO code number corresponds to contamination levels pertaining to three sizes.

The first scale number represents the number of particles larger than 4µm(c) per 100 millilitre of fluid, the second number for particles larger than 6µm(c) per 100 milllilitre of fluid and the third number for particles larger than 14µm(c) per 100 millilitre of fluid.

Below is a table of actual results obtained, of contamination within a hydraulic pump endurance test rig.

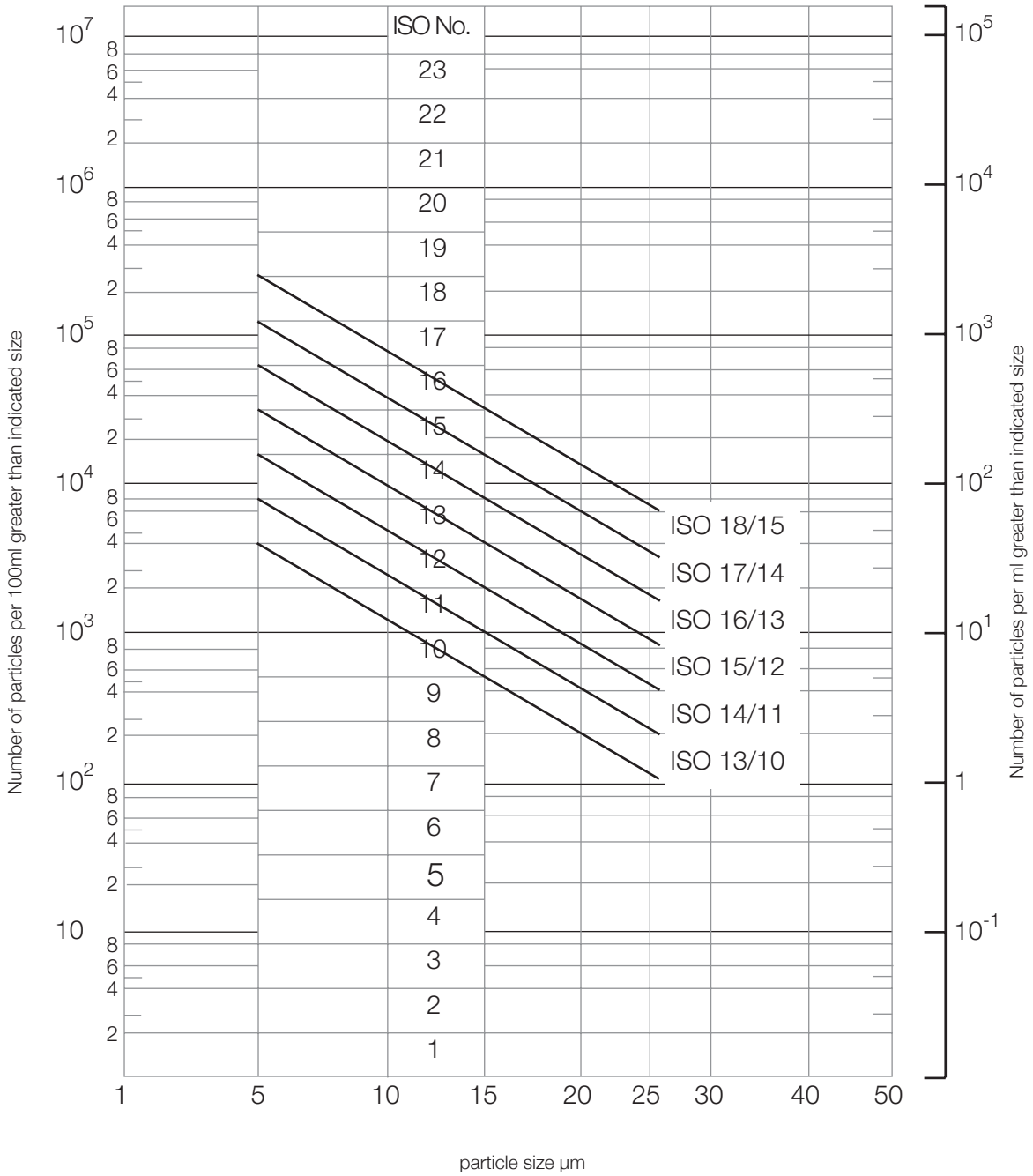
Particle size	No. of particles per 100ml of fuel
4µ	7950100
6µ	280500
14µ	1500
21µ	1700
ISO-Code: 24/19/11	



Note that interpolation (i.e. estimation within the measured range) is acceptable; extrapolation (i.e. estimation outside of the measured range) is not.

ISO4406 particle distribution chart

The chart includes various ISO level contamination grades



ISO contamination charts

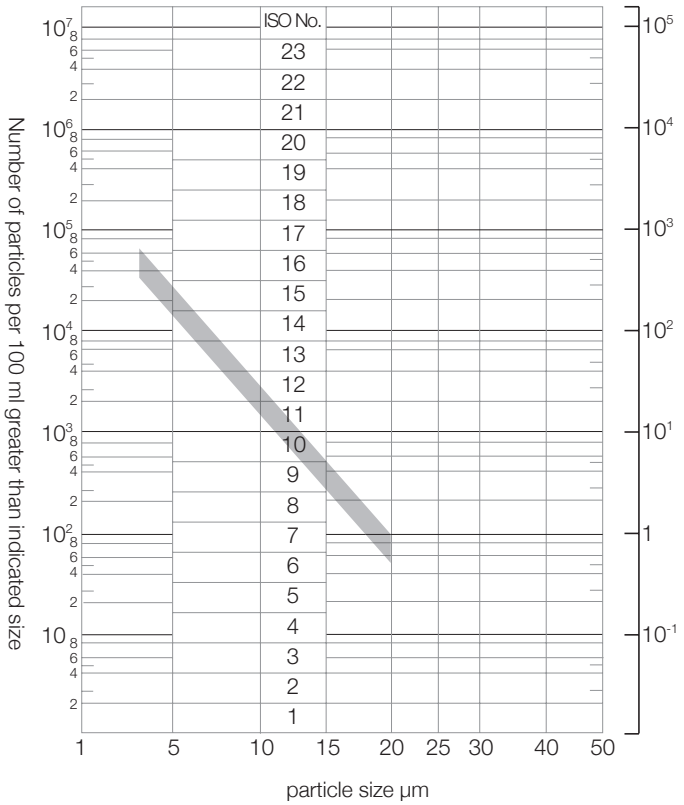
Typical system applications and code numbers

These typical applications and ISO code numbers are taken from the UK Contamination and Control Research Programme (1980–1984).

Ref. AHEM Guide to Contamination Control in Hydraulic Power Systems – 1985

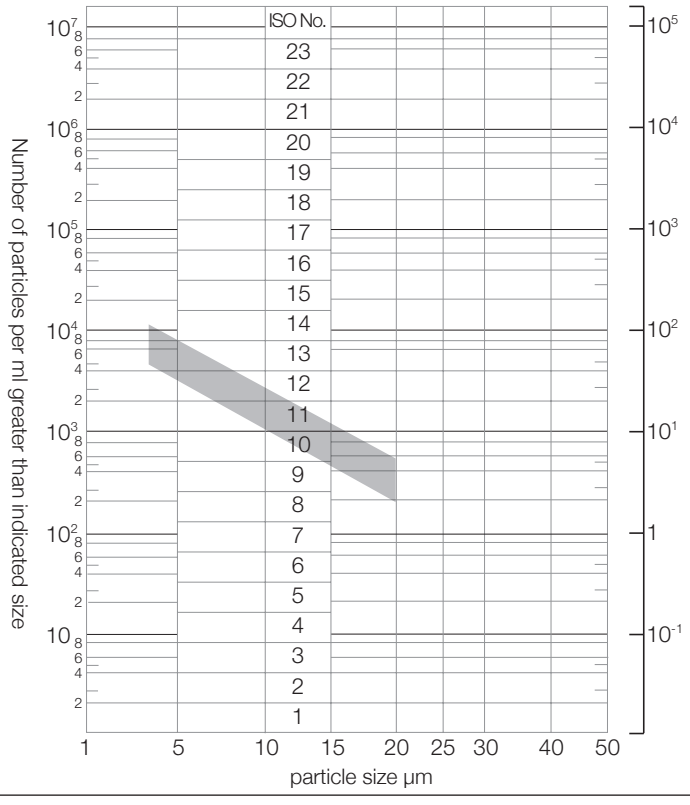
SOLID CONTAMINANT CODE NO 15/9

Application: Machine tools



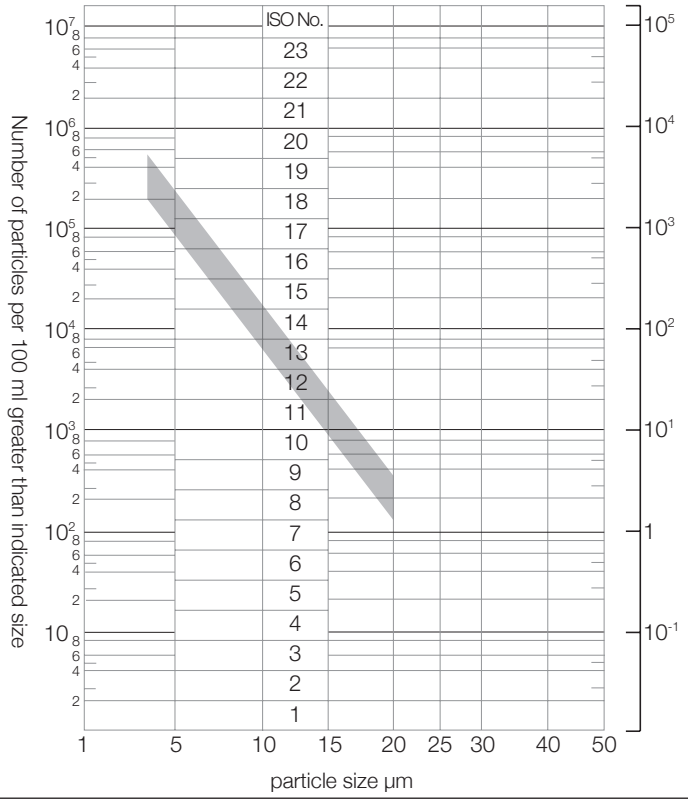
SOLID CONTAMINANT CODE NO 13/10

Application: Aircraft test stands



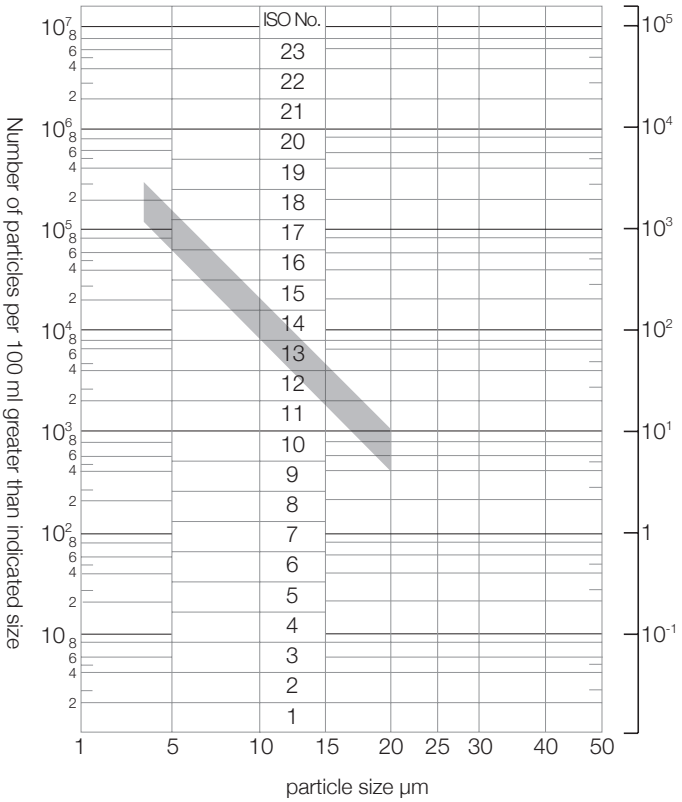
SOLID CONTAMINANT CODE NO 18/11

Application: Mobile systems



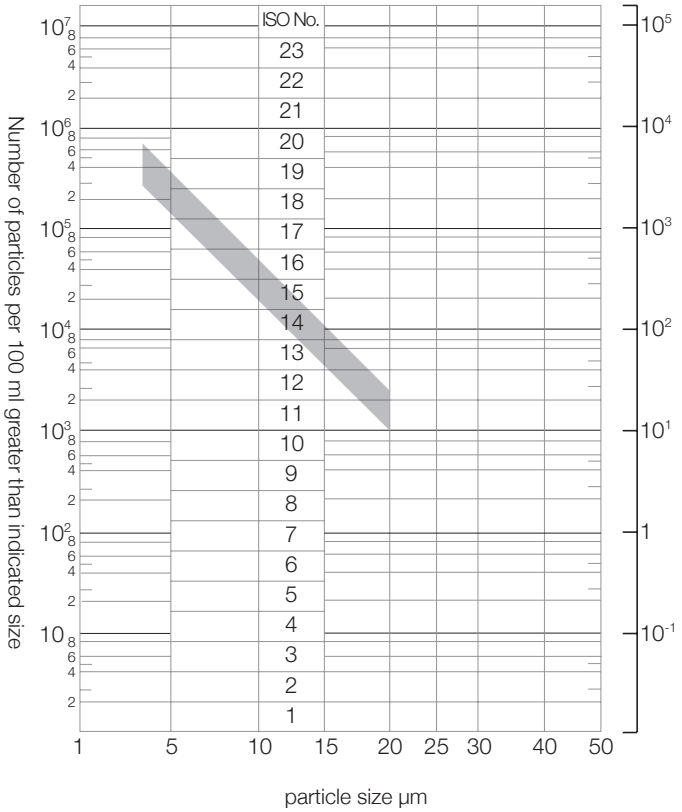
SOLID CONTAMINANT CODE NO 17/12

Application: Marine installations



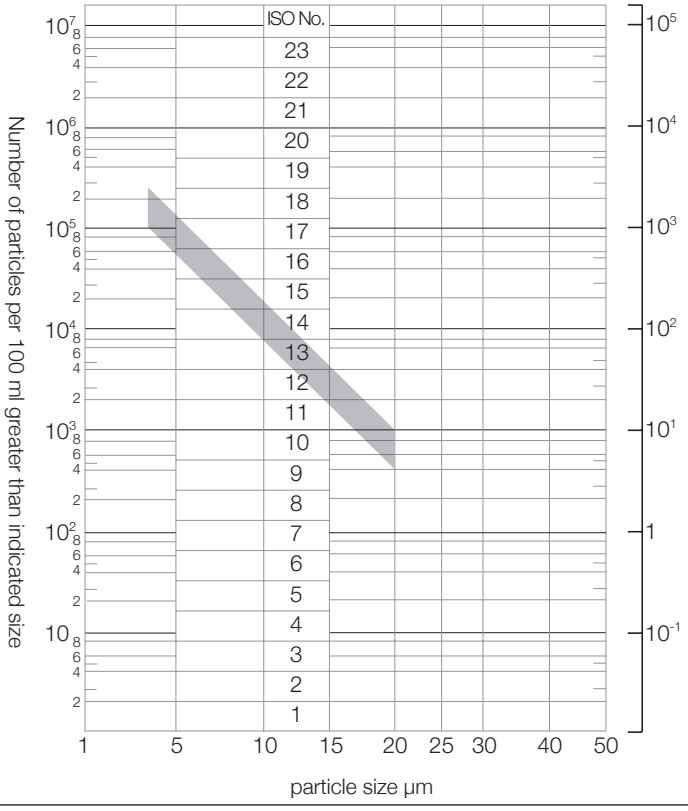
SOLID CONTAMINANT CODE NO 18/13

Applications: Mechanical handling

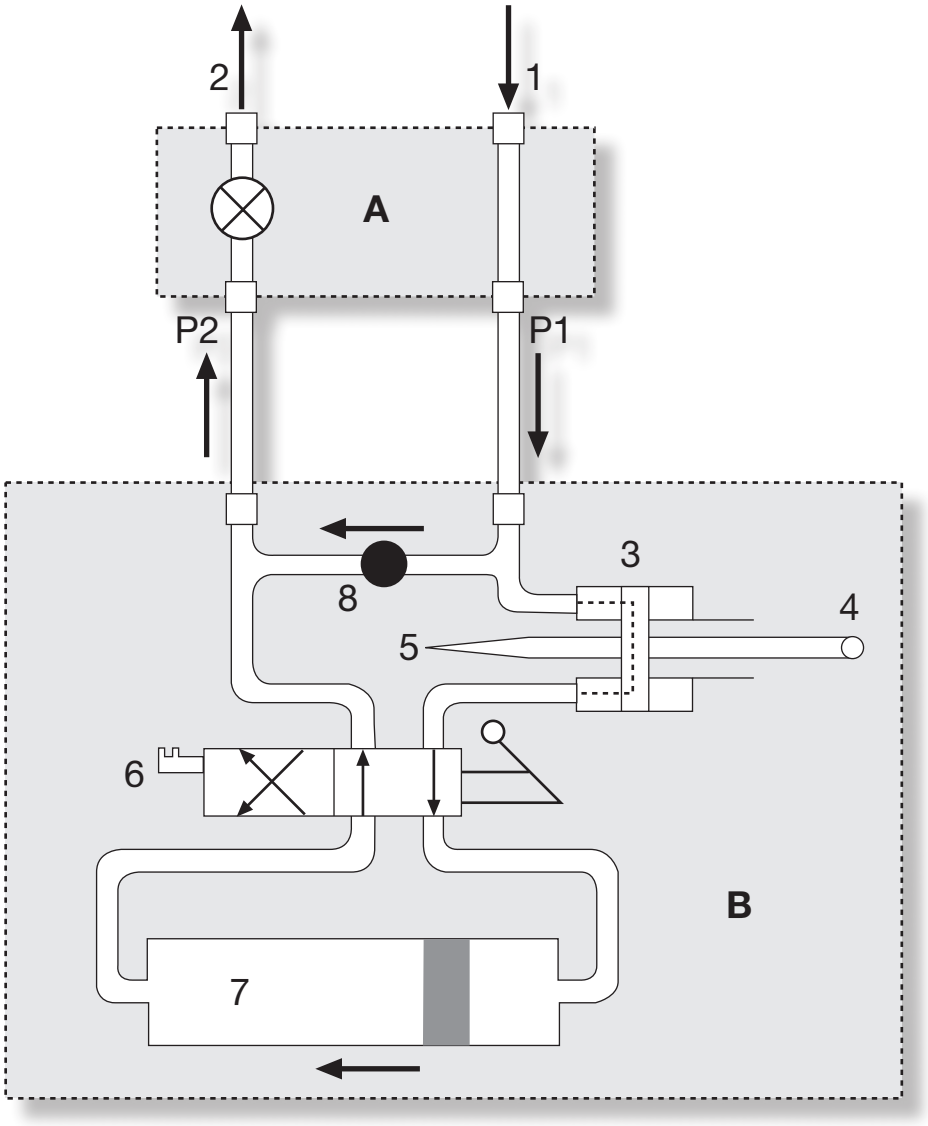


SOLID CONTAMINANT CODE NO 16/11

Applications: Injection moulding;
Metalworking;
Unused commercial-grade oil

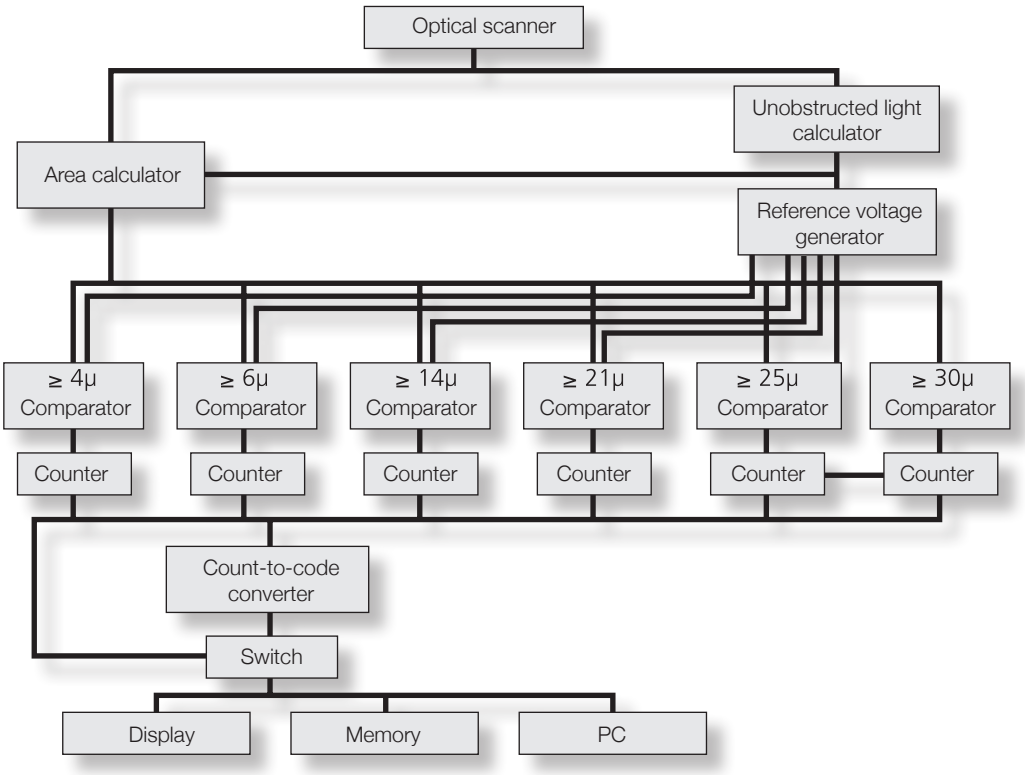


Fluid flow schematic



A. Lift Pump Unit	
1	Sample Pipe Inlet
2	Sample Pipe Outlet
B. Main Unit	
3	Monitor block
4	Laser Diode
5	Optical Scanner
6	Main Control Valve
7	Dual Direction Syringe Pump
8	Flow Probe Device

Analysis schematic



Measurement accuracy

CALIBRATION

Every monitor is individually calibrated using an accurately determined gravimetric level of test dust media.

Each channel within the instrument is adjusted to read the number of particles in a prescribed size range as specified in ISO procedures, thus guaranteeing calibration accuracy.

REPEATABILITY

The icountACM202024 measures and quantifies individual particles using advanced electronics and laser technology to ensure a high degree of repeatability.

Repeatability is typically better than 5%.

Technical specification

Construction	Unit, hand-held display and carrying case: ABS plastic Keypad: fluorosilicone rubber
Mechanical components	Brass, plated steel, stainless steel and aluminium
Seals	Viton
Inlet/Outlet hoses	Nylon (Kevlar braided microbore). Stainless steel armoured ends. Fluid connection hose: 1.2 metres (1 metre extensions can be used) Hand-held display cable length: 1 metre
Fluid compatibility	Aviation fuel. For other fluids consult Parker
Fuse	1.25A fast blow fuse included for overload protection Return icountACM202024 to Parker Hannifin if the fuse is blown
icountACM202024 technology	Microprocessor controlled laser optical scanning system
Repeatability/Accuracy	Better than 5% (typical)
Fuel viscosity range	2–100 centistokes
Fuel temperature range	+5°C to +80°C
Operating temperature range	+5°C to +40°C
Test completion time	2 minutes
Computer Interface	RS232 at 9600 baud
Weight	icountACM202024: 6.5kg, Carrying case: 8.5kg
Commissioning kit	ParSmart Downloader software plus cable 12Vdc charger and cable Rechargeable battery pack, 12Vdc power supply, 6 x 1.5D batteries 2 x printer rolls, 1 x printer ribbon Screwdriver UK, US and Euro power plug and cable Millipore adaptor assembly

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