



**SERIES OF DESKTOP
METALS ANALYSERS
USER GUIDE**

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At ARUN Technology MetalScan Limited we are always willing to give help and advice on the use and maintenance of our spectrometers for metals analysis. We aim to provide the best information to assist the user and welcome any comments to improve this guide.

Please send any comments to

sales@aruntechnology.com

We also offer full service and technical support, see our website for details

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IMPORTANT SAFETY INFORMATION

The instrument has been designed and constructed to ensure that there is no risk to the user when it is used correctly as specified in the instructions.

Please read

Section 1 Safety Information

in this manual before proceeding further.



NOTE: This particularly applies when samples are being analysed as a high voltage is applied between the counter electrode and the sample.

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1 Safety Information

1.1 Electrical safety

The ac mains power supply used by the MetalScan PolySpek Jnr is 90-260V AC, 50/60Hz, single phase. ***The instrument must be grounded.***

The instrument must be serviced by trained personnel only, as there are dangerous voltages inside the instrument.

Do not open the instrument case without first disconnecting the ac supply.

If in any doubt regarding electrical safety, always consult a qualified electrician.

1.2 Using Argon gas

During analysis the MetalScan PolySpek Jnr uses argon gas to exclude air from the spark stand and where necessary purge the UV-optic. Argon is an inert gas and is not poisonous, but, at high concentrations, it becomes an asphyxiant by reducing the oxygen available in the air. It is therefore recommended that you use the instrument in a well-ventilated area.

1.3 Recommended procedure

To ensure the safety of the operator, and to obtain consistent results, the following procedure is recommended as standard practice:

1. Ensure that the instrument is properly installed and set up as described in this guide. Allow it to stabilise.
2. Ensure that the electrode is cleaned with the electrode brush and then, using the handheld vacuum cleaner, suck out any soot from the spark chamber.
3. Check the electrode gap.
4. Adjust the height of the sample clamp so that the sample fits easily beneath it.
5. Position the sample on the spark-stand so that it fully covers the spark chamber aperture.
6. Press the Start button to start the analytical cycle.
7. At the end of the analytical cycle remove the sample, clean the electrode and reposition the sample for the next spark, ensuring that the spark area does not overlap the previous spark.
8. For each new sample, repeat steps 5 through 7.

For a more detailed description of the analysis procedure, see MM00032.

1.4 Operator training and instrument servicing

All MetalScan PolySpek Jnr series instruments are for use only by trained operators. If you are in any doubt about how to operate the instrument, please consult ARUN Technology or your local distributor.

To increase the life and reliability of the instrument regular maintenance and servicing of the PolySpek Jnr series instruments must be carried out. Only trained personnel must perform maintenance.

Servicing by anyone other than a qualified ARUN-trained service technician will void the warranty of the instrument as will the use of non-genuine ARUN Technology spare parts.

For further information on training and instrument servicing contact your local representative or ARUN Technology MetalScan Limited

Website: www.aruntechnology.com/contactus

Email: service@aruntechnology.com

Email: sales@aruntechnology.com

2 Introducing PolySpek Jnr

The MetalScan PolySpek Junior is a high precision optical emission spectrometer for the quantitative analysis of solid metal samples and their alloys. The instrument is desktop-mounted and is capable of giving analytical results suitable for process control, certification of products and other applications demanding rapid quality analyses.



The MetalScan PolySpek Junior

2.1 The MetalScan PolySpek Junior series

The MetalScan PolySpek Jnr series of desktop metals analysers provides for the analysis of a wide range of metal types. The models available are: -

- | | |
|------------------------|--|
| PolySpek Jnr | 170-410nm, Available with flushed or non-flushed optics. |
| PolySpek Jnr-L | 170-780nm multi-optic for Aluminium base requiring Na, Li, K |
| PolySpek Jnr-X | As per PolySpek Jnr for use with external PC |
| PolySpek Jnr-XL | As per PolySpek Jnr L for use with external PC |

The PolySpek Jnr X and XL versions are also available as XT and XLT models with a built-in touch screen utilising an external PC.

2.2 How the MetalScan PolySpek Jnr works

The operating principle of the PolySpek Jnr is Optical Emission Spectrometry often referred to as 'OES'. An electrical discharge is applied between the counter electrode and the surface of the prepared metal sample. This is carried out in an argon atmosphere inside the spark-stand and referred to as a 'spark discharge'. Some of the sample surface material is vaporised releasing the radiation of light at specific wavelengths dependent on the elements present. Light from the spark passes into the spectrometer arrangement of the instrument. Here, CCD (charge coupled device) solid-state detectors measure the relative amplitudes of the different wavelengths of light. Processing of this spectral data yields the analytical results. The analysis program specifies which elements are to appear in the analysis and their concentration ranges. The analytical results appear as percentage values, against each element detected in the sample. Any element outside the programmed limits is highlighted. The values thus indicated should be regarded as estimates only.

MetalScan PolySpek Jnr instruments are supplied ready programmed for the analysis of the particular metal bases specified by the user. For a base metal, an element is calibrated to cover an analytical range. A set of element calibrations, covering all the likely elements for a metal type is known as a matrix calibration or program. These are normally set for some or all of the elements to agree with the ranges specified in material standards such as ASTM, ISO, DIN and BS.

The MetalScan PolySpek Jnr is controlled via a built-in panel PC used to store calibration data and analysis results. An external printer can be attached to provide a hard copy of the results. Operation is straightforward using simple icon driven and multi-choice menus. Each analysis takes from 10 to 30 seconds, depending on the metal being analysed.

Note: *PolySpek Jnr models with an 'X' suffix are controlled via an external PC.*

The argon exhaust passes into a twin-bottle system that maintains the pressure of argon gas in the spark chamber of the MetalScan PolySpek Jnr. The oil level in the second bottle should be checked regularly and kept full to the line indicated. The exit pipe should be kept clean and free of debris.

Analysis results are displayed on the screen and a hard copy can be obtained on a printer.

Before you can use the MetalScan PolySpek Jnr it must be installed and set up correctly.

Once the instrument is ready for use and the sample prepared, the analysis procedure is simple:

- Select the analytical program to use.
- Adjust the sample clamp so that there is sufficient room for the sample to fit underneath the clamp head.

- Place the sample so that it completely covers the electrode aperture.
- Press the **Start** button.

If all is well, at the end of the spark time, the results will appear on the screen display.

The important things to remember for a successful analysis are:

- Select the correct analysis program.
- Prepare the sample properly.
- Maintain the instrument regularly and keep the spark chamber clean

2.3 Supply requirements

Details of the services and installation requirements can be found in the MetalScan MM00003 publication.

Power:

The mains power supply should be provided via a fused outlet or one fitted with a current protection device. The mains power supply requirement of the instruments is single phase (phase, neutral & earth) supplied at 90-260V AC at 50/60 Hz.

Argon:

High purity spectroscopic grade 99.9995% (99.998% min)
Input pressure: 3.5 - 5 bar (52-75 PSI)

Nitrogen: *(Optional purge gas)*

High purity Oxygen free
Input pressure: 3.5 - 5 bar (52-75 PSI)

Easily accessible connectors on the panel at the rear left-hand side of the instrument provide push fit connections for electrical power, argon gas and data communications.

3 Installing MetalScan PolySpek Jnr

3.1 Siting MetalScan PolySpek Jnr

ARUN Technology desktop (bench mounted) spectrometers are intended for installation at a predetermined location. Although the instruments are easily moved they are not considered to be transportable.



Note: *Desktop instruments weigh in the order of 25-35Kg. Care must be taken when carrying or moving the instrument into position using safe lifting techniques and the assistance of another person where possible.*

Details of the services and installation requirements can be found in the MetalScan MM00003 publication.

The following considerations should be made when choosing a suitable installation location: -

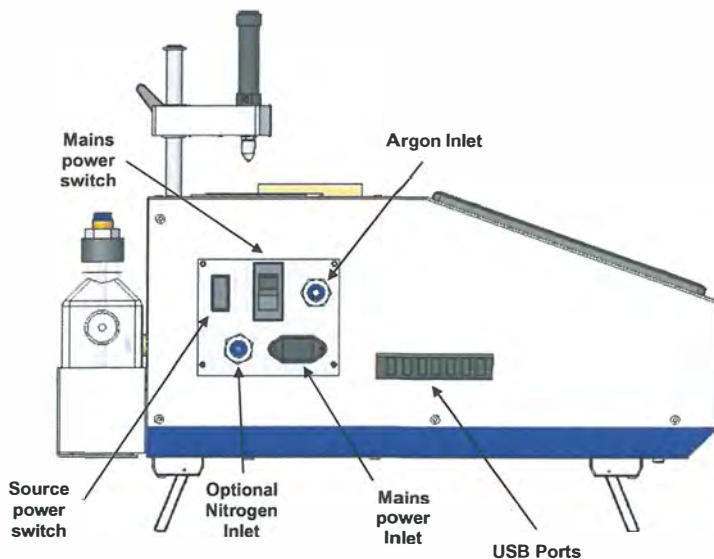
- You will need access to an electricity supply and an Argon gas supply.
- The room is large enough for the instrument and all of the associated peripheral equipment.
- A firm surface is available to support the instrument and peripherals at a comfortable working height that is not subject to large vibration such as that from large presses or hammers often found in foundries. It should allow for a gap of approximately 10cm for cooling air to circulate around the instrument.
- The instrument should not be in direct sunlight or subject to large temperature variations. An operating temperature of 15–35 °C (59–86 °F) should be maintained.
- All power and gas supplies are sited within easy reach and of the correct specification.
- Sample preparation equipment should where possible be located in a separate adjacent room to minimise possible problems with computer equipment due to metallic dust and to minimise the time between sample preparation and sparking.
- Sufficient ventilation is available
- The room should be prepared and any decoration completed in advance to ensure that the room is as clean and dust free as possible.

Note: If an external computer system is used with the instrument then the PolySpek Jnr software must be installed separately. Details for the software installation can be found in the MetalScan MM00036 publication.

A certified high-speed USB cable **MUST** be used for data communication.

The connections to the PolySpek Jnr are all made on the left-hand side panel.

Left-hand side view



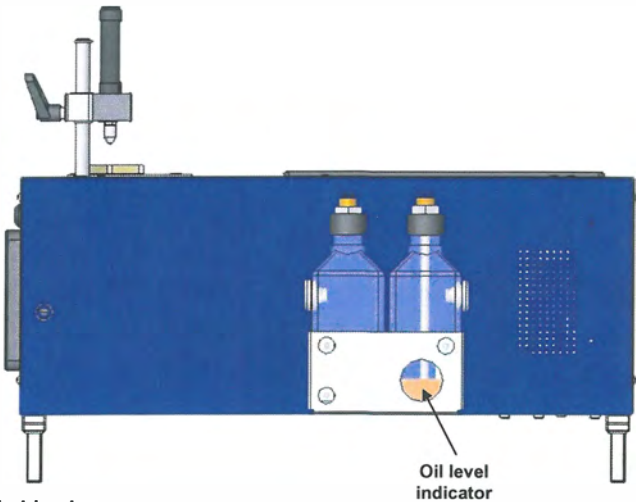
On the left-hand side of the instrument there are two power switches. The large green illuminated circuit breaker switch controls the mains power to the instrument. The source power switch is the smaller grey switch that controls power to the spark stand. This is used to disconnect power to the spark stand when performing routine maintenance tasks such as cleaning the spark stand and spectrometer entrance windows as described in the maintenance section of this guide.

Power inlet: The mains power supply requirement of the instruments is single phase (phase, neutral & earth) supplied at 90-260V AC at 50 or 60 Hz.

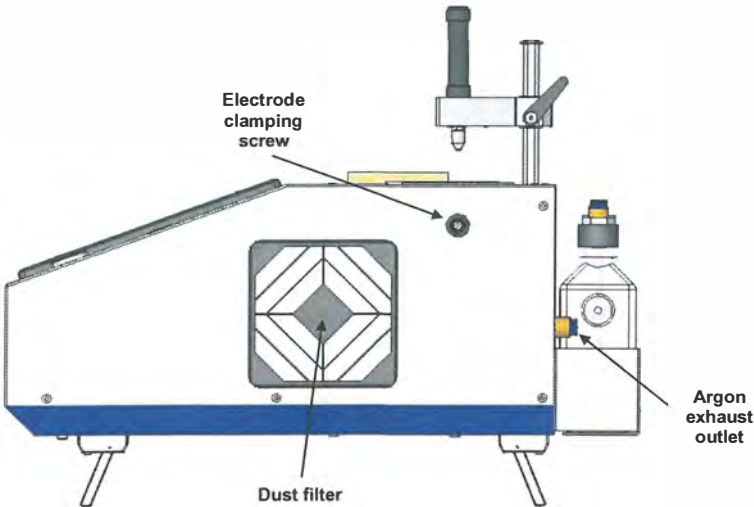
Argon inlet: High purity spectroscopic grade (99.998% min)
Input pressure: 3.5 - 5 bar (52-75 PSI)
Supply tubing: 6mm outside diameter. PTFE (Teflon)

Nitrogen inlet: (Optional purge gas)
High purity Oxygen free
Input pressure: 3.5 - 5 bar (52-75 PSI)

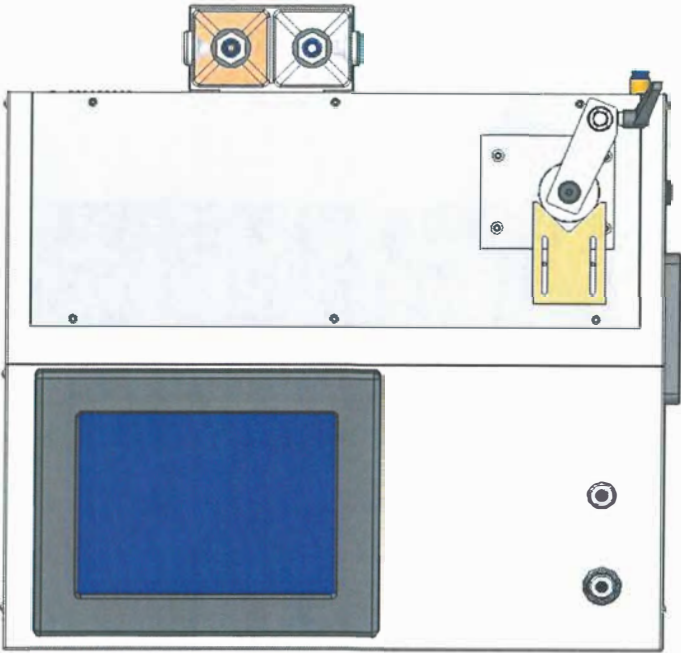
Rear view



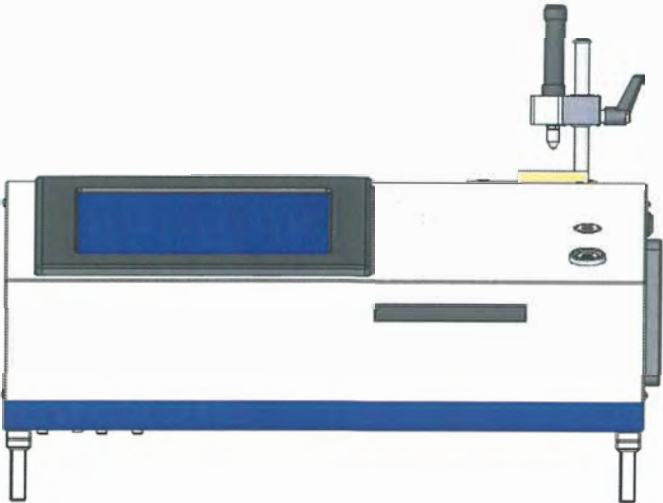
Right-hand side view



Top view



Front view



The instrument is quite simple to install.

Having unpacked the instrument and accessories the procedure is:

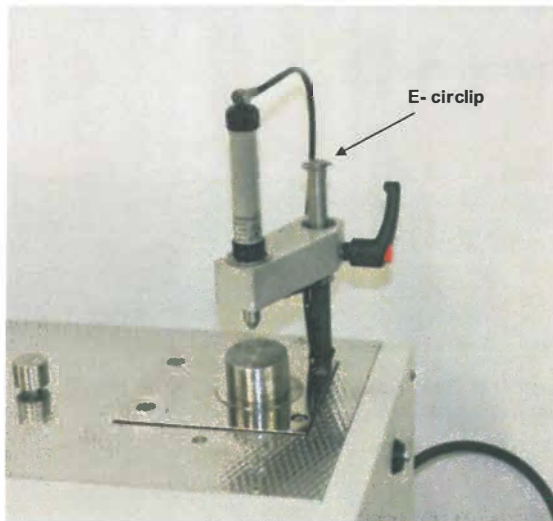
1. Place the sample clamp arm over the clamp pillar and secure with the clip.
2. Connect the Argon exhaust bottle assembly and the Argon gas supply.
3. Adjust the electrode.
4. Connect the electrical power supply lead.
5. Switch on the instrument.

When you switch the instrument on, give it time to stabilise before you use it.

Note: If an external PC is used with the instrument the instrument control software will need to be installed See MM00036 PolySpek Jnr SW installation.

3.2 Connecting the Sample clamp

1. Slide clamp arm onto the vertical clamp pillar.
2. Place "E" Circlip onto the groove, at the top of the pillar.
3. Connect the tubing to the push-fit connector



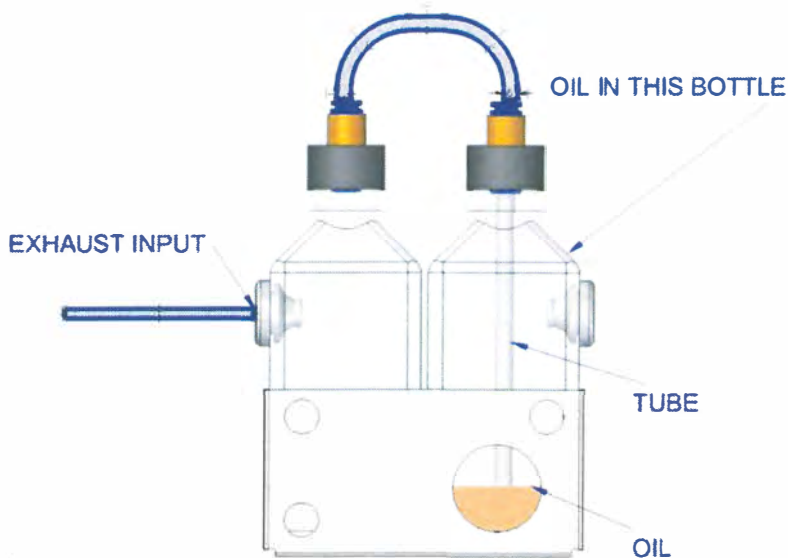
The complete sample clamp assembly.

3.1 Argon exhaust bottle assembly

The argon exhaust bottle assembly consists of two bottles, a mounting bracket and four screws. The first (Left-hand side viewed from the rear of the instrument) is an empty dry bottle. The second bottle (Right-hand side viewed from the rear of the instrument) is filled with the oil (PN: MA00030) provided, to the half way level as shown on the diagram below.

Note: *The oil bottle is the bottle containing the long tube.*

The exhaust input to the dry bottle comes from the exhaust output at the rear of the instrument.



Note: The output of the exhaust tube from the oil bottle should be vented outside of the room or to an external extraction system wherever possible.

3.2 Connecting the argon gas supply

Make the Argon gas connections, using 6mm o/d PTFE tubing:

1. For all models, fill the argon exhaust bottle (right-hand side when viewed from the rear) with the oil provided to the indicator line and connect the input from the dry bottle (left hand side when viewed from the rear) to the argon exhaust outlet.
2. Connect the Argon gas supply to the Argon gas inlet on the instrument. (See rear view)

Note: It is important that you use only Teflon™ (P.T.F.E) tubing for connecting the Argon supply. Any other type of tubing may contaminate the Argon gas, leading to poor burns and invalid results. Do not exceed 3 meters of tubing from the Argon supply to the instrument. For distances more than 3 meters copper tubing should be used.

3.3 Adjusting the electrode

For the instrument to operate correctly, you must periodically set the counter electrode in the spark stand to the correct depth. A grip screw holds the electrode in place, and you can release this to allow for adjustment or replacement of the electrode.

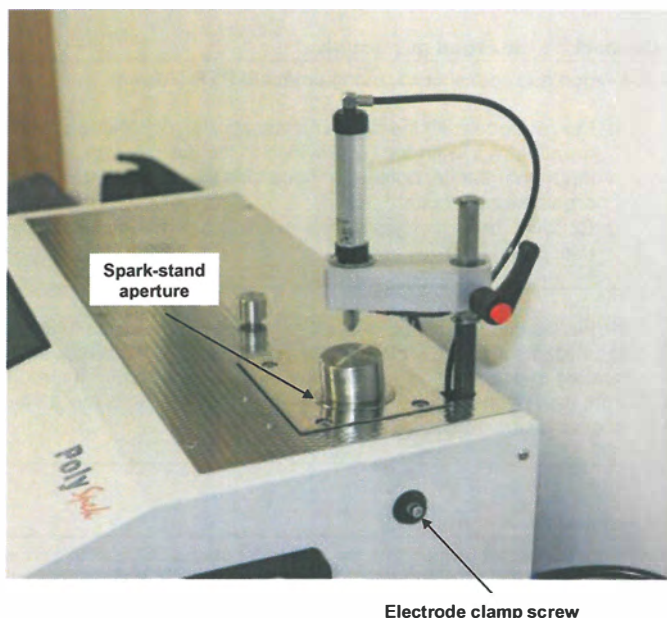


The electrode is spring-loaded.

*Releasing the grip screw without restraining the electrode may cause it to fly out of the spark-stand with some force. **Always use the gap-setting tool to cover the electrode before releasing the electrode grip screw.***

The procedure for adjusting the electrode is:

1. Check that the electrode is clean and correctly shaped (90 degree angle)
2. Place the gap-setting tool (PN: MD00089) provided over the spark-stand aperture and gently release the electrode grip screw using the 4mm ball-ended driver supplied (PN: MB00093).
3. Push the electrode down with the raised part of the gap-setting tool until the tool is pressed firmly into the spark-stand aperture.
4. Tighten the electrode grip screw and remove the gap-setting tool. The electrode tip should now be 4mm below the surface of the spark-stand aperture.



3.4 Connecting the external PC

If the PolySpek Jnr is an 'X' model and the PC was not supplied with the instrument, the instrument control software will need to be installed (See MM00036 PolySpek Jnr SW installation).

The PC connects directly to the PolySpek Jnr via the USB communications port on left-hand side of the instrument. All peripherals such as monitor, keyboard, mouse and printer connect to the relevant connection ports on the PC.

3.5 Connecting the power supply

The ac mains power supply to the PolySpek Jnr is connected with a standard IEC mains connector lead. This plugs directly into the mains input socket found on the left-hand side of the instrument. For safety, the main power switch should be in the off position when connecting or disconnecting the ac mains power supply.

3.6 Installing a USB device

The MetalScan PolySpek Jnr comes equipped with a multiple USB port for connection to peripheral devices. Certain devices may require specific drivers.

3.7 Stabilisation period

To achieve good results the MetalScan PolySpek Jnr needs to stabilise. After switching on the Argon and electrical supplies, the unit needs approximately 30 minutes to flush out any air or moisture in the system. PolySpek Jnr models with a flushed UV optical system require additional time to flush with argon gas. This can take several hours to achieve but the ***"RapidStart"*** feature can be used to accelerate the start-up time. This can also operate using Nitrogen as the purge gas if preferred. (Argon gas is still required for analysis.)

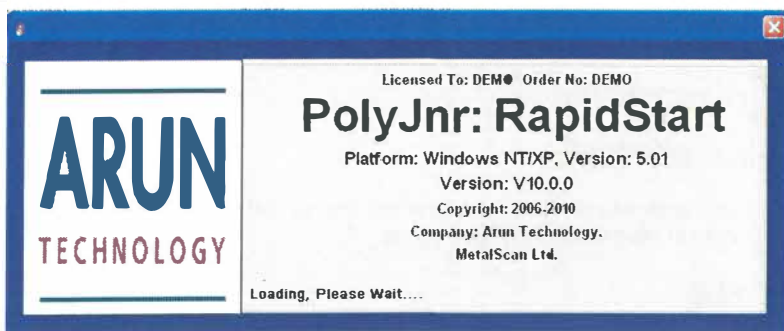
The unit is designed to remain in standby and it is recommended to leave the unit switched on although the argon can be turned off overnight if preferred. Always check that Argon is flowing before burning a sample. The instrument may be severely damaged if burns are made in air. If the unit is not required for a long time and you decide to switch it off, observe the stabilisation period or use the RapidStart option before use. To conserve gas when you switch the unit off, ***turn the gas off at the cylinder!***

The argon gas controller can be configured and optimised for the user via the software interface, your installation engineer can advise on this during installation.

3.8 RapidStart

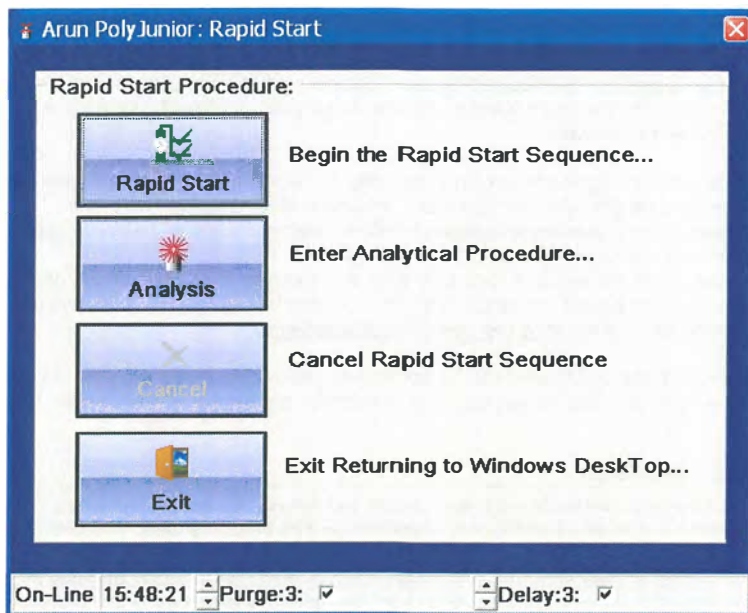
The A-PLUS software will automatically run the RapidStart routine when started. This feature provides a flexible and cost effective option for the user. The opening screen allows the user to choose to run the RapidStart procedure or to go straight to the analytical software interface. If no selection is made, after a preset delay the RapidStart routine will automatically continue with the high flow Argon (or optional Nitrogen) purge followed by the stabilisation period before automatically opening the analytical interface.

Note: A sample must be covering the spark-stand aperture and the Source power switch must be in the on position to enable the RapidStart feature to function correctly.



The RapidStart loading screen

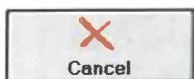
The opening screen allows the user to choose to start the RapidStart sequence or go directly to the analytical mode interface.



The RapidStart opening screen

The status bar at the bottom of the screen informs the user at what point in the sequence the RapidStart operation is. Typically the RapidStart sequence is set for a 3 minute high-flow purge of the spark-stand followed by a 30 minute settle time for the instrument.

The RapidStart sequence may be cancelled at any time by clicking on the **Cancel** button.

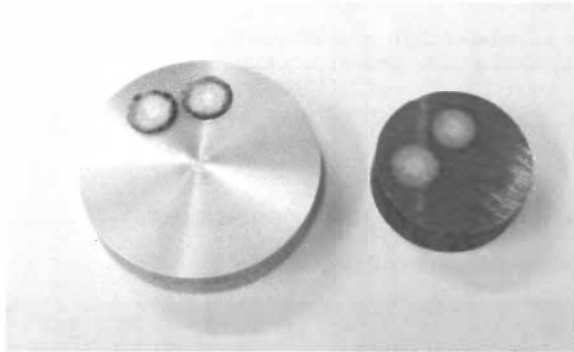


The RapidStart sequence may run at any time by clicking on the RapidStart icon at the bottom of the analytical interface screen.



In order to check that the system has been purged completely and is working correctly, you should carry out a spark on an appropriately prepared sample (See section 5)

The picture below shows a series of good burns on Steel and Aluminium samples:



If the burn marks are white or grey, the system may not have been purged completely. If you do not get good burns after several attempts, and you have flushed the system for a reasonable time, you should check the argon supply system for leaks or other problems such as poor quality argon gas or moisture contamination.

Note: The middle area of the sample often contains defects from rapid cooling; better results are usually obtained if you position the sample so that the burn is made towards the outside edge of the sample. The supplied sample fence may be used to facilitate this.

3.9 Profile Check routine

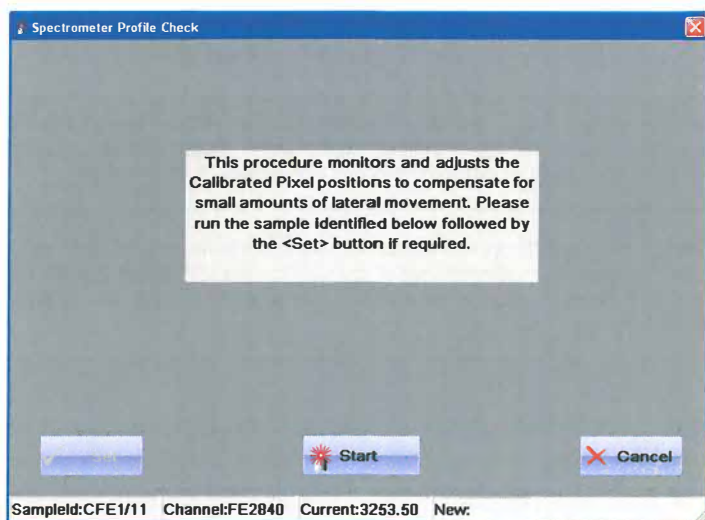
Once the PolySpek Jnr has been installed and the RapidStart sequence completed the instrument will need to be profiled. Profiling ensures that all of the peak positions of the analytical wavelengths used during calibration are correctly located.

The profile check sequence may be initiated from the drop down menu at the top of the screen or by clicking on the profile check icon,



located on the bottom of the analytical interface screen.

The following screen will be displayed.

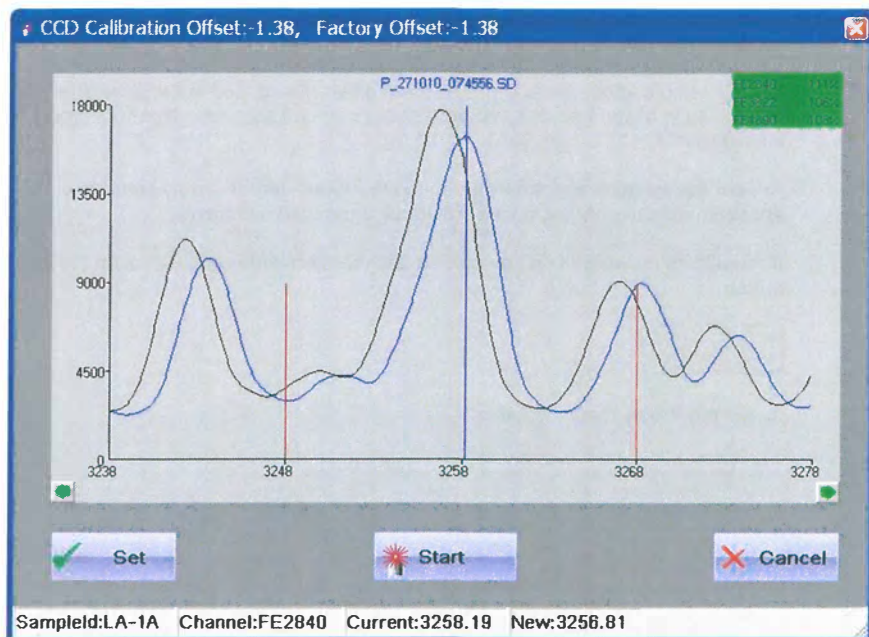


The required sample to be sparked is shown at the bottom of the window. In this example the sample to be sparked is CFe1/11. The sample should be prepared using the appropriate method (See section 5) and placed on the spark-stand.

Click on the Start button icon to start the **Profile Check Routine** sequence.



At the end of the spark the following screen will be displayed.



The Profile Check Routine displays the obtained peak position and intensity for the selected spectrometer and compares this to both the last known value and the factory obtained value during manufacture of the PolySpek Jnr. The PolySpek J, JX and JXT comprise of a single spectrometer, the PolySpek JL, J LX and JLXT has two spectrometers.

In the example it is for a single spectrometer. The values shown at the top of the screen show the difference in pixel position as "Factory Offset" and Calibration Offset". The displayed peaks are of the last peak obtained during the Pixel Check Routine (shown in blue with its time and date) and the current peak position (shown in black.) The difference between these peak positions is shown against the "Calibration Offset" as a fractional pixel movement value. If peak has moved then the Set icon should be used to allow for the profile position to be modified.

Click on the Set icon



This will automatically adjust the peak pixel position for all wavelengths used on the current spectrometer.

In the example above there is a measured difference of 1.38 in the peak pixel position (*displayed in black*) from the last profile check run (*displayed in blue with time and date information*)

Repeat this for each spectrometer on the PolySpek Jnr. This may be up to 2 spectrometers depending on the PolySpek Jnr model purchased.

If there is no movement on any of the spectrometers then simply click on the Cancel button



to exit the Profile Check Routine.

3.10 Care of the MetalScan PolySpek Jnr

The MetalScan PolySpek Jnr embodies a number of delicate assemblies, including a high precision optical system and a number of specialised electronics units. To maintain the calibration of the instrument and to ensure that it has a long working life, observe the following points:

- Do not drop or strike the instrument.
- Avoid using or storing the instrument outside the specified temperature ranges.
- Avoid high humidity, water splashes, etc.
- Never do a burn with the Argon gas supply absent, no sample present, or the electrode set incorrectly.
- Always follow the instructions and guidance given in this manual.
- Always follow the warnings given in Section 1 of this manual.
- Regularly maintain the instrument, as detailed in Section 4 of this manual.

3.11 PolySpek Jnr specification

Weights and dimensions

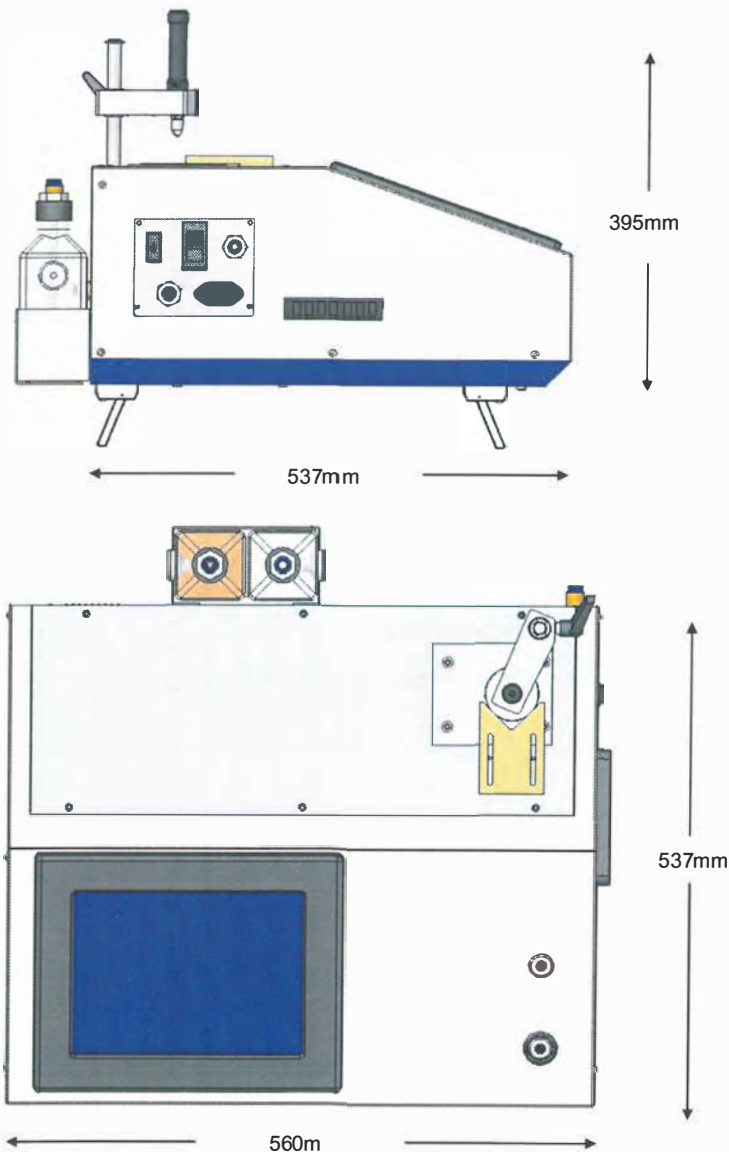
Instrument size 560 x 537 x 395 mm (approximately 22 x 21 x 15.5 inches)

Weight – 30 Kilos (66 lbs)

Environmental requirements

Operating temperature 15 to 35°C (59 to 95F)

3.12 Dimensions



3.13 Items supplied check list

The following items are supplied with the MetalScan PolySpek Jnr and should be checked against the packing list, MM00030, on delivery. If any item is missing or damaged contact your supplier immediately.

- MetalScan PolySpek Jnr unit
- Setting-up samples (SUS)
- Power lead
- MetalScan PolySpek Jnr User Guide MM00031
- MetalScan PolySpek Jnr A-PLUS Software User Guide MM00032
- Exhaust bottles assembly
- PTFE tubing and fittings,
- Vacuum cleaner
- Accessory kit, including the electrode gap setting tool,
- MetalScan PolySpek Jnr Software Installation Guide MM00036
- Keyboard & Mouse
- Printer (Optional).
- CDROM/DVD for system software

Note: It is advised to save the packing of the PolySpek Jnr, as it will provide the most secure means of transporting the unit, should this become necessary in the future.

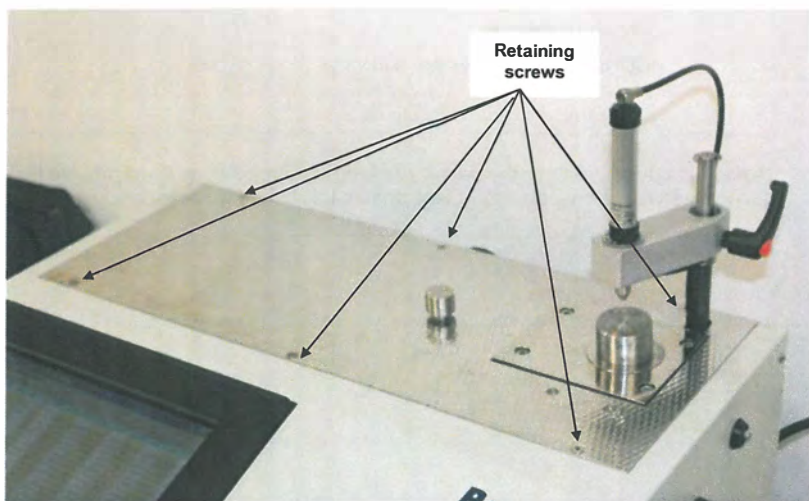
4 Taking Care of PolySpek Jnr

The MetalScan PolySpek Jnr desktop spectrometers are designed to require a minimum of routine maintenance. The spectrometer has an entrance window that requires periodic cleaning. This will be dependent on the sample throughput of the unit and the user is recommended to set-up a routine maintenance program accordingly for the instrument. The standardisation factors can be used as a general indication of the transmission quality of the windows. Generally the rotational standardisation factors are close to a value of 1.0 or unity and when these increase, it is an indication that the window needs cleaning.

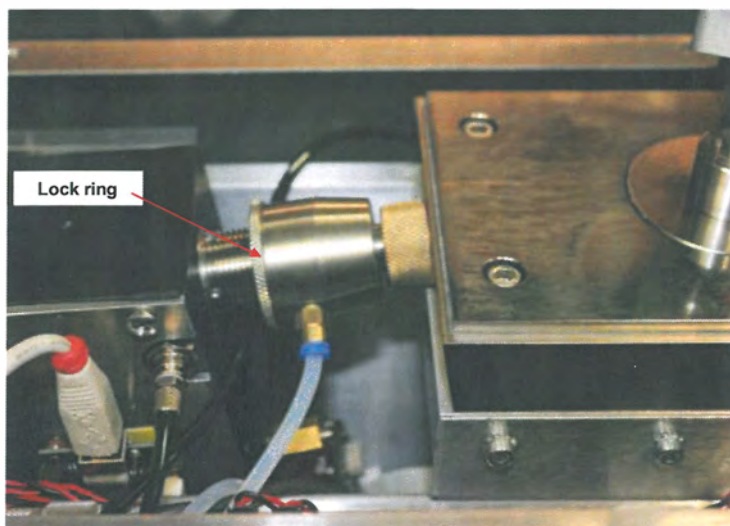
4.1 Cleaning the entrance window

The cleaning of the window in the spectrometer is a simple procedure.

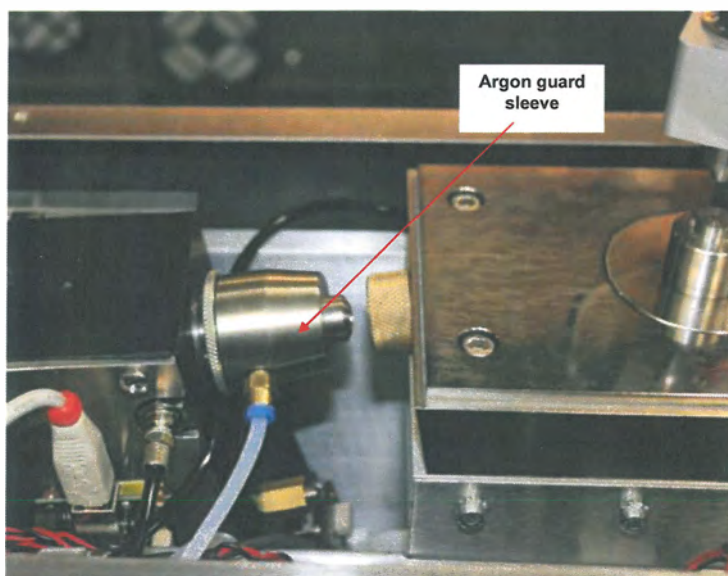
1. Turn off the source unit power switch
2. Using the 2mm ball-ended driver supplied (PN: MB00094), undo and remove the 6 retaining screws in the spark-stand surround.



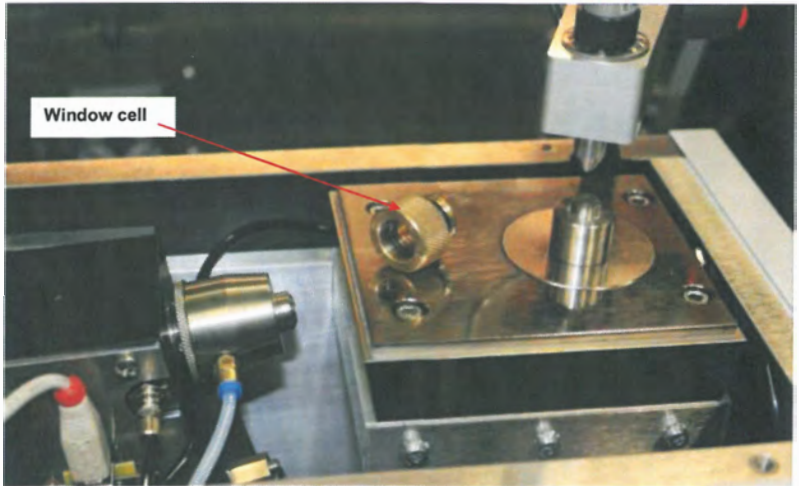
3. Release the argon guard sleeve lock ring by rotating anti-clockwise.



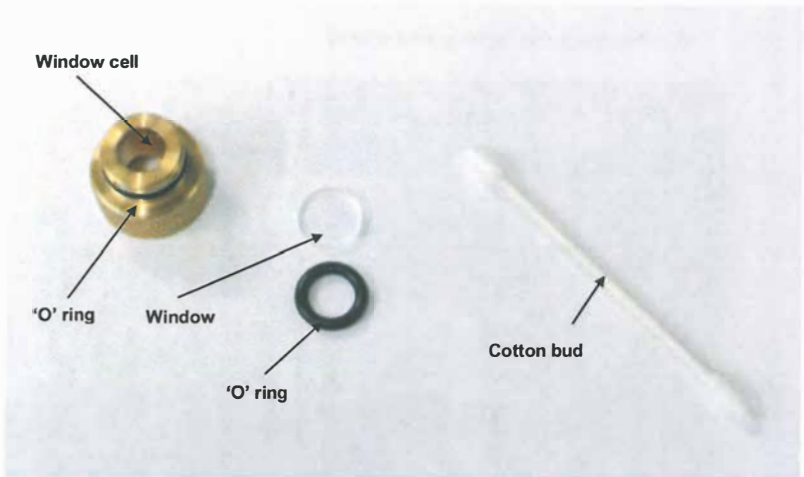
4. Slide back the Argon guard sleeve.



5. Remove the window cell.



6. Using a cotton bud PN: ATL350205, clean both sides of the window.

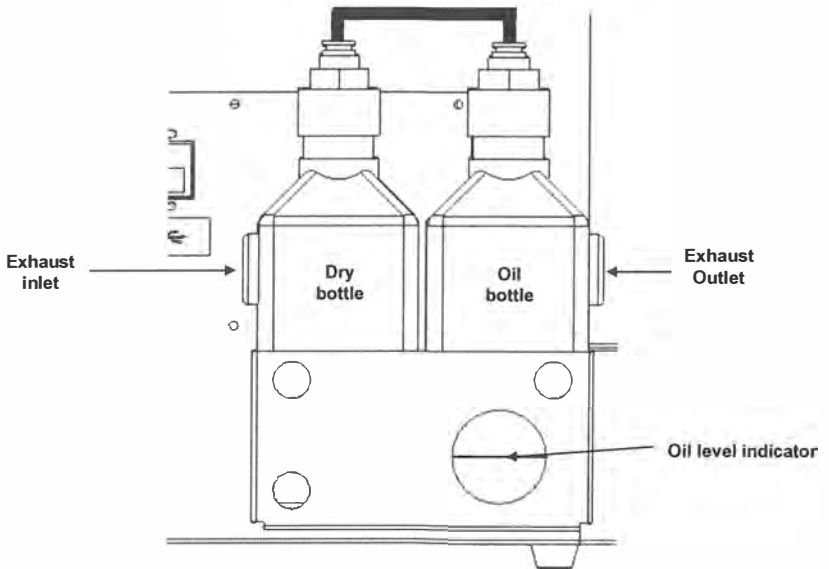


7. Reverse steps 5-3 ensuring that the 'O' rings are properly located within the window cell.
8. Replace the spark-stand surround and turn on the source unit power switch.

If the unit is not required for a long time and you decide to switch it off, observe the stabilisation period before use. To conserve gas when you switch the unit off, turn off the gas at the cylinder!

4.2 Argon Exhaust System

During the spark discharge, particles are produced from the sample under test and are removed from the spark-stand chamber by the flow of argon. The argon exhaust passes through the instrument into the first of a twin bottle exhaust system on the rear of the unit. The first bottle is an empty dry bottle used to collect the heavier particles; the exhaust gas then passes into the second bottle that contains a synthetic oil to filter out the lighter particulates and finally vents any remaining gas through the outlet port.

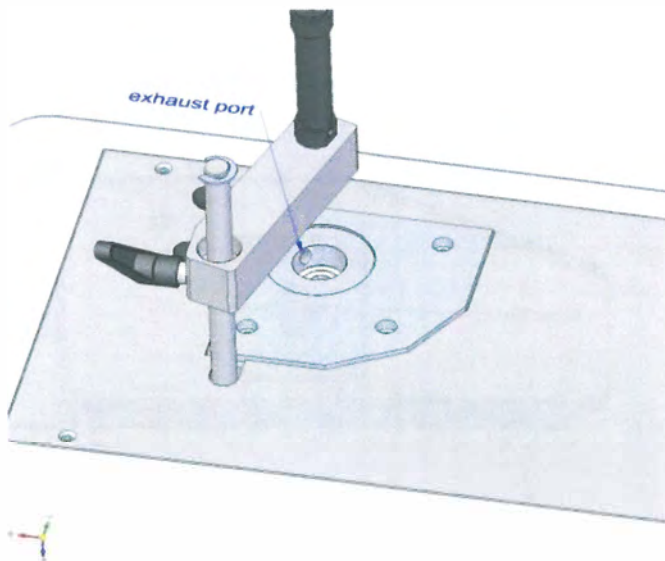


The oil bottle is also used to provide backpressure to the argon flow; this is pre-determined by the level of oil and thus should be maintained such that its level is halfway in the oil level indicator-viewing window. The oil (PN: MA00030) does not evaporate but will need changing periodically depending on the sample type and throughput due to the filtering of the particulates.

Note: It is recommended that the output from the exhaust is vented outside of the working area to the atmosphere where possible. The exhaust tube must be kept clear and not compressed or blocked.

It is recommended that the dry bottle is emptied weekly and the oil is replaced every 3 months. The exhaust pipe should also be cleaned every week.

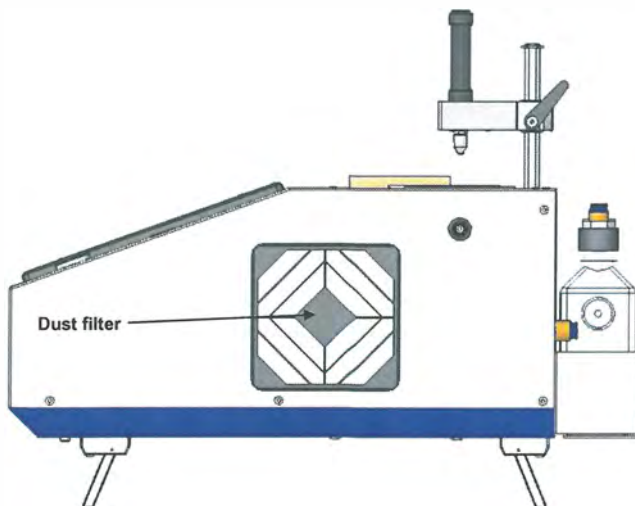
To clean the pipe, remove the sparkstand insert from the sparkstand to reveal the electrode and insulator. The exhaust port is positioned where shown within the spark chamber.



Remove the exhaust tube from the dry bottle at the rear of the instrument, cover the end of this tube with a disposable wipe and blow the pipe through from the sparkstand exhaust port with either nitrogen, dry air or a disposable air duster. Remove both screw caps from the exhaust bottles, cover the end of the tube from the oil bottle with a disposable wipe and blow the pipe through from the cap of the dry bottle again with nitrogen, dry air or a disposable air duster. Reassemble the bottles, exhaust pipe and replace the sparkstand insert.

4.3 Fan Filter

A fan at the right hand side of the instrument draws cooling air in through a dust filter. This filter will need to be cleaned or replaced at regular intervals depending on the cleanliness of the environment in which the PolySpek Jnr is sited.



To replace the dust filter (PN: 410186) simply pull the black filter cover off, remove the filter and replace. The filters are pre-cut to size and should fit neatly inside the black housing. This is then clipped back into place. The filter should be checked on a weekly basis and cleaned or replaced as necessary.

5 Preparing the Metal for Analysis

5.1 Sourcing the metal for analysis

In all cases, the metal to be analysed must be of good quality and representative of the batch being sampled. The various qualities that a metal should have for a reliable analysis are listed below

5.2 Metal sample requirements

To give the best results the MetalScan PolySpek Jnr requires a good quality, freshly prepared surface. The main requirements of the metal for analysis are:

- | | |
|---------------------|--|
| Solidity: | The metal must be solid and free from porosity, blowholes, cracks, inclusions, etc |
| Homogeneity: | The metal must be free from segregation of elements. |
| Surface: | The sample surface must be: <ul style="list-style-type: none">• flat (in order to form a gas seal on the sample plate)• big enough to completely cover the electrode aperture• clean• free from oxidation• dry |
| Cleanliness: | Spark emission spectroscopy is a surface technique and any foreign material on the surface is likely to affect the results. The prepared surface of the sample should not be touched before analysis. |
| Thickness: | Normally, the metal for analysis must be at least 3mm thick. However, under specific conditions, thinner samples can be analysed. In cases of uncertainty, consult ARUN Technology. |

Preparation varies with different metals. Brief details for some common metals are given below. Remember to prepare samples for setting up in addition to the metal you want to analyse.



Metal preparation can involve hazardous operations such as handling molten metal, grinding, use of milling machines/lathes, etc. Only trained personnel should carry out such procedures.

5.3 Preparing a sample for analysis

Steels and nickel alloys

Liquid samples can be obtained by using suitable ceramic dip samplers. When solidified, the sample can be prepared by grinding a suitable flat surface. The surface can be finally prepared for analysis by finishing with a 40 - 60 grit abrasive finisher. Finer grades of abrasive (100 grit or more) such as those used for metallography should not be used, as a shiny surface may hamper analysis.

Cast irons

Producing good cast iron samples for analysis is notoriously difficult due to the high level of carbon. Samples can easily be produced that are not homogeneous and these can give poor results on the spectrometer.

Liquid samples should be poured into a special "coin" mould intended for cast iron sampling. This provides for rapid cooling and a chilled sample with a 'white' form. When solidified, the coin can then be prepared by removing at least 2mm from the surface with an abrasive wheel grinder. Do not use cutting or grinding fluids when doing this; they will contaminate the sample and give poor results.

Al, Zn, Mg base samples

Liquid samples taken from furnaces should be chill-cast into a "mushroom" shape using a steel or copper mould.

An ingot can be checked by cutting slices (minimum 5mm thickness) from an ingot, preferably not too near the end. Sampling from several ingots will allow assessment of the consistency of a batch. For best accuracy, samples should be re-melted and chill cast in a mould to eliminate any segregation across the depth of an individual ingot. For an average chemistry for a batch of ingots, samples from different ingots can be melted together, mixed and chill cast. Beware of reduction in more volatile elements (e.g. Mg) when re-melting. This can be overcome by using vacuum or Argon atmosphere re-melting.

In all cases, the sample must be machined either on a lathe or on a milling machine. The surface must be smooth and flat to ensure a gas tight seal with the sample plate. To be representative of the internal content of the sample, at least 2mm of material must be removed. Cu base samples

Sampling can be as described above in Section.

The samples can then be prepared either by lathe or milling, or by use of a finishing device such as a belt sander or rotary finisher.

5.4 Sample preparation equipment

ARUN Technology can supply a range of preparation machines, sample moulds and consumables for different types of samples. Contact ARUN or your local distributor for more details.



SERIES OF DESKTOP

METALS ANALYSERS

USER GUIDE



Software

Part Number: MM00032

Issue: 1.2

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Author: LML

Language: English

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At ARUN Technology MetalScan Limited we are always willing to give help and advice on the use and maintenance of our spectrometers for metals analysis. We aim to provide the best information to assist the user and welcome any comments to improve this guide.

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1 Introducing A-PLUS

The A-PLUS software by MetalScan Limited has been designed to provide the user with a simple to use intuitive interface for the operation of the MetalScan PolySpek Jnr desktop spectrometer. Although all of the commands described in this section are available from the drop down menus found at the top of the Analytical interface screen, this section will concentrate on the icon driven commands as these are often found to be the easiest way for the user of driving the software.



Note: Do NOT re-install the software without consulting ARUN Technology service support, service@aruntechnology.com or an irreversible loss of data may occur!

2 Initial set-up

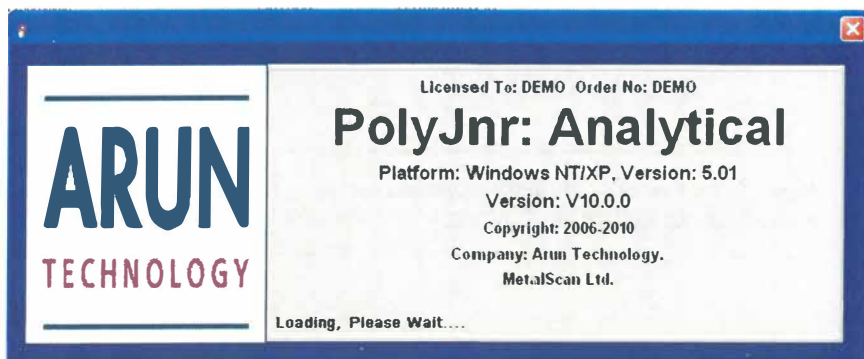
2.1 RapidStart

The A-PLUS software will automatically run the RapidStart routine when started. This feature provides a flexible and cost effective option for the user. The opening screen allows the user to choose to run the RapidStart procedure or to go straight to the analytical software interface. If no selection is made, after a pre-set delay the RapidStart routine will automatically continue with the high flow Argon (or optional Nitrogen) purge followed by the stabilisation period before automatically opening the analytical interface.

Note: A sample must be covering the spark-stand aperture to enable the RapidStart feature to function correctly.

This feature is described in detail in MM00031 PolySpek Jnr User Guide.

The opening screen of the A-PLUS software interface is shown below

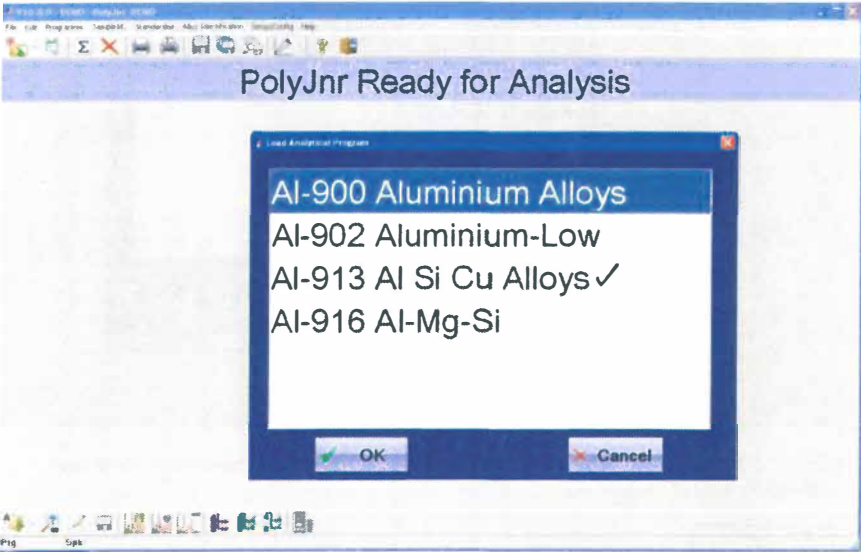


This will briefly be displayed during the initial period of communication between the PC running the A-PLUS software and the PolySpek Jnr. When the communication has been established the instrument 'green start button' will be illuminated.

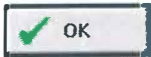
Once the software has loaded, the main analytical screen will be shown. If the instrument has been purchased with more than one analytical program, a dialog box will be displayed automatically with a list of the programs installed allowing the operator to choose the calibration to use.

The content of the dialog box depends on the analytical programs purchased with your instrument, if you have purchased an instrument with only one analytical program, it will be loaded automatically ready for analysis.

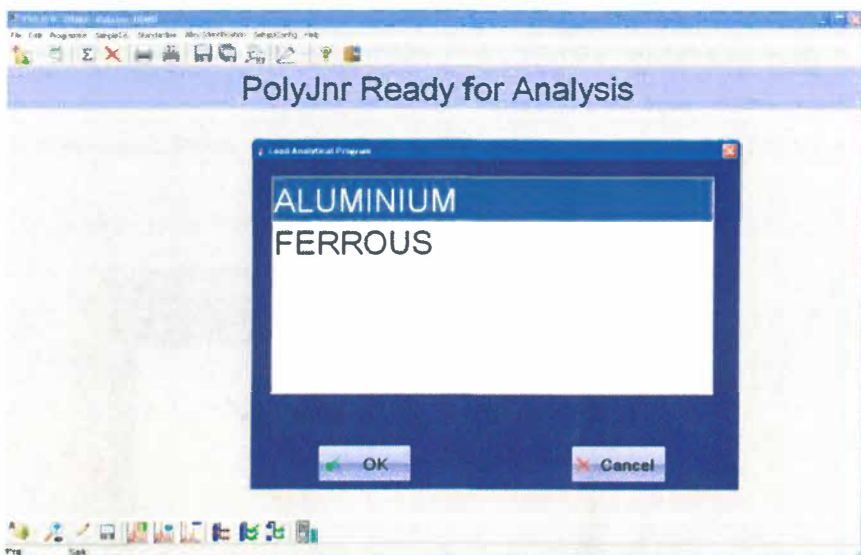
If however you have purchased several analytical programs then they will either be displayed as shown below or if there are several programs in a single base and there are too many to display at once on the screen then they will be displayed as base identities as shown over the page.



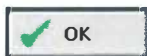
Highlight the analytical program to use by clicking on the calibration name and then clicking on the OK button.



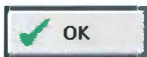
The selected analytical program will be loaded ready for analysis.



Highlight the analytical base program to use by clicking on the base name and then clicking on the OK button.



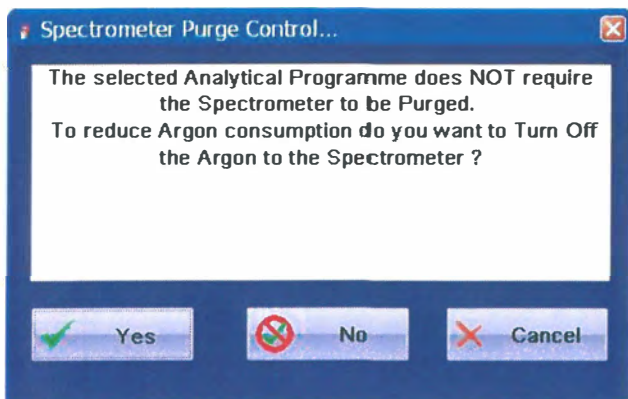
Highlight the analytical program to use by clicking on the calibration name and then clicking on the OK button.



The selected analytical program will be loaded ready for analysis.

Note: The instrument can be set-up to minimise argon consumption depending on the analytical calibration programs in use. Those programs that do not use wavelengths in the deep Ultra-violet region of the spectrum do not require the spectrometer to be argon purged. When the program is selected the user will be prompted if they wish to turn the argon purge off. Equally if a subsequent program selection is made that requires argon purge they will be prompted to turn the argon purge on.

In the following screen an Aluminium calibration has been selected that does not require the argon purge.

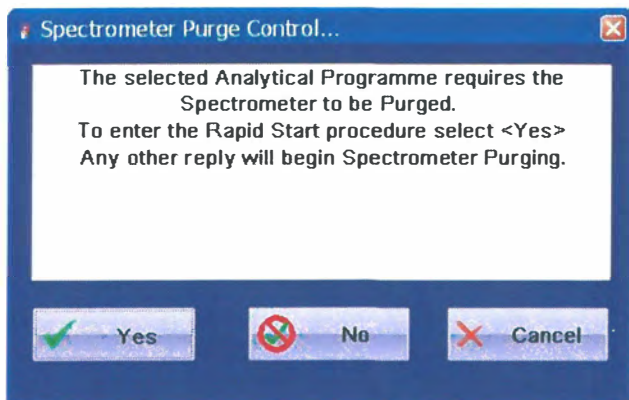


If the



Is selected then the argon purge to the spectrometer will be turned off.

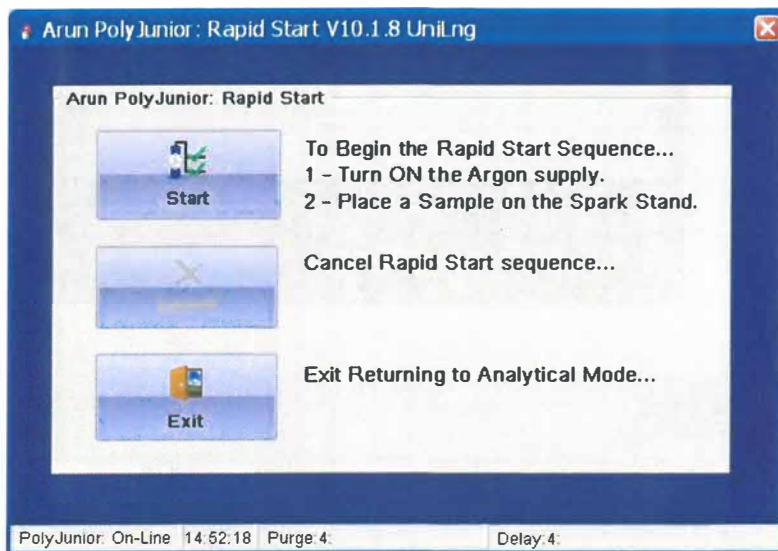
If the argon purge to the spectrometer is turned off and a calibration is selected that requires the argon purge the following screen will be displayed.



If the



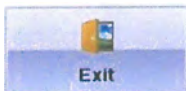
Is selected then the argon will be turned on and the following screen displayed



The Rapid Start sequence can be run by selecting



or if the Rapid Start sequence is not required then click on



this will return to the analytical screen and the spectrometer will purge normally.

Note: The instrument will require profiling during the initial set-up procedure and standardising before analysis can begin. The **Standardisation** procedure is described later in [section 4](#).

2.2 Profile Check Routine

Once the PolySpek Jnr has been installed and the RapidStart sequence completed the instrument will need to be profiled. Profiling ensures that all of the peak positions of the analytical wavelengths are correctly located.

The profile check sequence may be initiated from the drop down menu at the top of the screen or by clicking on the profile check icon, as shown below, located on the bottom of the analytical interface screen.



The Profile Check routine is described in detail in MM00031 PolySpek Jnr User Guide.

Note: The profile of the PolySpek Jnr is monitored constantly and the user will be alerted to run the Profile Check Routine should it be necessary at any future stage.

2.3 Spectrometer temperature

The temperature of the spectrometer is constantly monitored. This is displayed at the bottom of the screen as shown below



The temperature indicated on the left-hand side is the current measured temperature within the spectrometer enclosure, 32 degrees in the example. The temperature on the right-hand side is the temperature recorded when the last Profile Check Routine was performed, 28 degrees in the example. If the difference in the current temperature to temperature recorded during profiling exceeds a pre-set limit the user will be prompted to re-profile the instrument.

3 Analysis

The PolySpek Jnr has been supplied factory calibrated using internationally recognised certified calibration standards for your analytical requirements. Each of the calibrations purchased includes the relevant Setting up samples, SUS, used to standardise the instrument.

Once the instrument is ready for use and the sample is correctly prepared (see section 5 in MM00031), the analysis procedure is simple:

- Select the program to use using the Load analytical program icon.



- Click on the required calibration from the list of calibrations shown

The top of the screen will display that the PolySpek Jnr is ready for analysis and the calibrated elements will be displayed vertically down the left hand side of the screen. If there are too many elements to display, 'buddy bars' will appear to allow scrolling of the element list. The analyses will be displayed in columns and when multiple analyses on the same sample are performed, the standard deviation, **SD**, and or relative standard deviation, **RSD** will also be displayed. The screen display may be customised as described in [section 3.2](#).

- Adjust the sample clamp so that there is sufficient room for the sample to fit underneath the clamp but within the 25mm travel of the clamp piston.
- Ensure that the electrode is brushed clean.
- Place the sample so that it completely covers the spark-stand aperture.

The sample clamp has a safety interlock to ensure that power to the electrode is not applied if a sample is not present over the spark-stand aperture. Failure to have an electrical conducting path through the clamp to the sample and then to the spark stand will cause the analysis sequence to abort automatically.

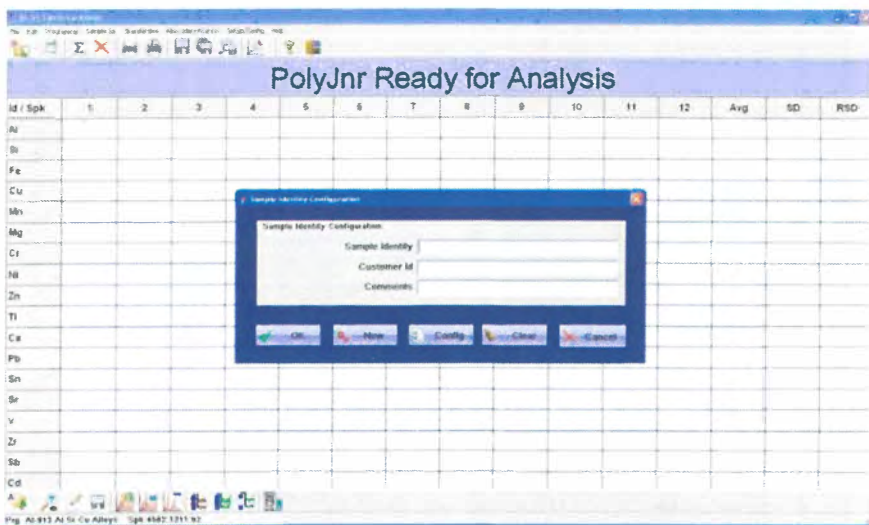
Although not essential, sample identification is normally given to each sample under test. This not only assists in identifying the sample but also enables the result to be stored and retrieved for future reference. The results can also be exported to other destinations for further processing.

The sample identity needs to be input prior to the analysis sequence being started.

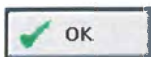
To enter a sample identification simply click on the sample-id icon



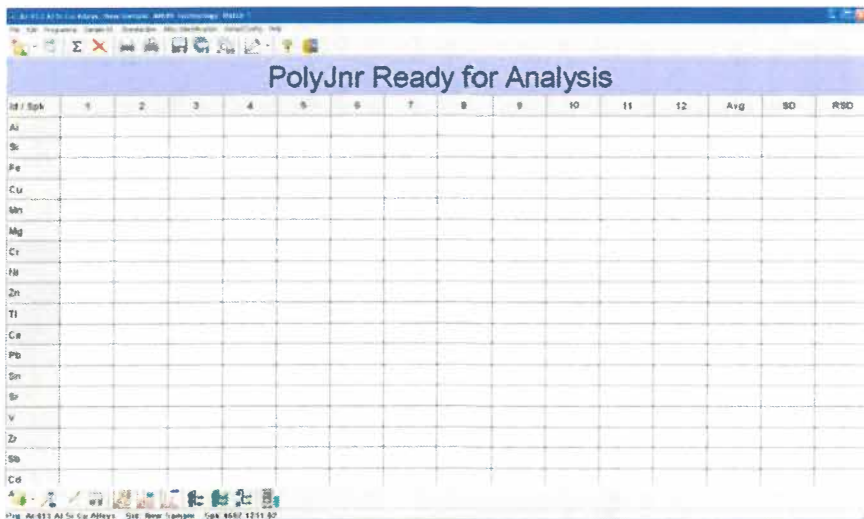
The Sample Identity screen will then be displayed where the operator can enter specific information relating to the sample under test. This is a configurable screen allowing the user to add custom sample identity information more relevant to the individual's requirements and this is discussed in more detail later in this guide (see [section 6.1](#)).



Once the sample identification information has been enter simply click the OK button



The sample identity is then shown in the screen header along with the program identity.

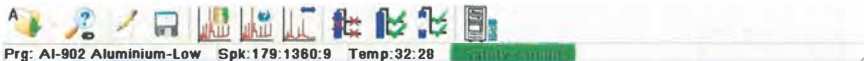


To start the analysis sequence press the green 'Start' button

The sample clamp will be activated and lowered on to the sample under test. This will make the safety circuit to enable the spark discharge sequence to start. Confirmation that the safety circuits have been made is displayed at the bottom of the screen.



The safety circuit display will change from red to green when the circuit is made as shown.



A dialog box will be displayed showing that the analysis is in progress. This shows the progress of the spark sequence starting with the argon flush period followed by the pre-spark and finally the exposure or measuring period of the sequence. The exposure may consist of several individual measuring periods.

The following screens show these in sequence.

Note: The spark may be stopped at any time by either pressing the Stop button on the PolySpek Jnr or pressing any key on the keyboard.