

	Complies	Does not comply
Check the functionality of the washing cup	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Check the hose connections for leaks	<input checked="" type="checkbox"/>	<input type="checkbox"/>

4 Maintenance work on accessories

Service the mobile cooling unit

	Complies	Does not comply
Vacuum or clean the condenser	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Record the condition of the cooling water before maintenance:		
Particles and discoloration present: <input type="checkbox"/> yes <input checked="" type="checkbox"/> No		<input type="checkbox"/>
cooling water flow rate	1.55	
Cooling water primary pressure	49 psi	
Conductivity of the cooling water	110	
Clean the water filter on the base unit (if filter is installed)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Renew cooling water	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<ul style="list-style-type: none">■ Prepare cooling water according to Analytik Jena's specifications■ Use cooling water additive from Analytik Jena		
Check filling level of cooling water, top up if required	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Cooling water circuit after maintenance

	Rated value	Actual value	Complies	Does not comply
cooling water flow rate	1.5 to 2.0 L/min	1.55	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Cooling water primary pressure	max. 6 bar (85 psi)	49 psi	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Conductivity of the cooling water	50 to 200 µS/cm	110	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Cooling water temperature (in mobile cooling unit)	18 °C	18	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Service the autosampler

	Complies	Does not comply
Check cannula and tubing to the base unit	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Check pump tubing (washing solution, waste), replace if necessary	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Clean the covers, rack mount and accessories	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Check the condition of the toothed belts for cracks, gaps and changes in color	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Check the peristaltic pump for smooth operation	<input checked="" type="checkbox"/>	<input type="checkbox"/>

5.3 Check of neon energy

The plasma must be ignited for this test (CCD cooling active).

	Rated value (Steps)	Actual value (Steps)	Complies	Does not comply
585.2462 nm	> 4000 ct/s	22689	<input checked="" type="checkbox"/>	<input type="checkbox"/>
594.4807 nm	> 3000 ct/s	8138	<input checked="" type="checkbox"/>	<input type="checkbox"/>
640.2217 nm	> 3000 ct/s	31788	<input checked="" type="checkbox"/>	<input type="checkbox"/>
849.5322 nm	> 3000 ct/s	3673	<input checked="" type="checkbox"/>	<input type="checkbox"/>
607.4311 nm	> 3000 ct/s	7114	<input checked="" type="checkbox"/>	<input type="checkbox"/>
659.8923 nm	> 3000 ct/s	10809	<input checked="" type="checkbox"/>	<input type="checkbox"/>
743.8864 nm	> 3000 ct/s	3297	<input checked="" type="checkbox"/>	<input type="checkbox"/>
703.2381 nm	> 10000 ct/s	31702	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Comments:

5.4 Adjustment of transfer optics (Mn 257.610 nm)

Adjust detection (axial)		Complies	Does not comply
X offset	-0.9	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Y offset	-1.6	<input checked="" type="checkbox"/>	<input type="checkbox"/>

5 Checking basic functions and device parameters

5.1 Check of correction functions

	Rated value (Steps)	Actual value (Steps)	Complies	Does not comply
As (193.6950 nm)	± 500	161	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Cu (324.7540 nm)	± 500	139	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Na (588.9953 nm)	± 500	101	<input checked="" type="checkbox"/>	<input type="checkbox"/>
K (766.4908 nm)	± 500	201	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Comments:

5.2 Check of safety circuits

	Complies	Does not comply
Safety circuit for torch position	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Safety circuit for door of plasma compartment	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Safety circuit for interrupted cooling water flow (cooling water flow < 0.85 L/min)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Safety circuit for suction power (check the setting Par[85])	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Value Par[85]:	3871	
Safety circuit for argon inlet pressure (p < 4 bar)* * if sensor is installed (Par[116] = 1)	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Comments:

Line	Peak position before correction	Peak position after correction	Difference Rated value	Difference Actual value
Zn 213.8560 nm	181.0 ± 2.4	181.0 ± 2.5	± 1.0	0.1
Mn (257.6100 nm)	181.0 ± 0.3	181.0 ± 0.2	± 1.0	0.1
Cu (324.7540 nm)	181.0 ± 0.1	181.0 ± 0.0	± 1.0	0.1
Li 670.7910 nm	181.0 ± -2.0	181.0 ± -2.4	± 1.0	0.4

Comments:

Robustness factor

Calculation according to the following formula:

$$F_r = \frac{\text{intensity } Mg_{280.271} / \text{intensity } BG_{Mg_{280.271}}}{\text{intensity } Mg_{285.213} / \text{intensity } BG_{Mg_{285.213}}}$$

Intensity / calculated factor	Value
Intensity Mg 280.271	1866858
Intensity BG Mg 280.271	4526
Intensity Mg 285.213	214606
Intensity BG Mg 285.213	8361
F_r	16.09

Comments:

Adjust detection (axial)		Complies	Does not comply
Intensity value	1996130	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Adjust detection (radial)			
X offset	15	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Y offset	0	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Intensity value	626098	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Comments:

5.5 Verification of the wavelength accuracy, generator robustness and analytical performance

- Requirements
 - Start ASpect PQ
 - Perform measurements with the standard sample introduction kit
 - Load the sequence "maintenance_PQ9000"
 - Plasma burn-in time 15 min
 - 1 mg/L multi-element solution (Merck standard IV for ICP) in 3 % HNO₃
 - Plasma conditions 12 L/min plasma gas, 0.5 L/min auxiliary gas, 0.6 L/min nebulizer gas
 - Plasma power 1200 W
 - Measurement time 10 s
- Start the sequence "maintenance_PQ9000" (duration approx. 40 min).
The sequence automatically loads the methods that are necessary to determine the data.



Wavelength accuracy

- Open the spectra display of the measured lines one after the other. Read off the peak position (peak position before correction). Carry out the peak correction by clicking on **[Find peak center]** and read off the peak position again (peak position after correction). Calculate the difference between the two values (peak position before correction - peak position after correction).



		Rated value	Actual value
	Relative standard deviation (RSD) [%]	< 2	0.29
Mn (257.6100 nm)	Limit of detection LOD [mg/L]	< 0.0004	0.000037
	Recovery [%]	100 ± 10	98.7
	Relative standard deviation (RSD) [%]	< 1.5	0.34
Cu (324.7540 nm)	Limit of detection LOD [mg/L]	< 0.0015	0.000149
	Recovery [%]	100 ± 10	100.8
	Relative standard deviation (RSD) [%]	< 1.5	0.11
Li 670.7910 nm	Limit of detection LOD [mg/L]	< 0.003	0.000193
	Recovery [%]	100 ± 10	99.5
	Relative standard deviation (RSD) [%]	< 1.5	0.47

Comments:

—

Analytical performance			
	PlasmaQuant PQ 9000 Elite		
Zn 213.8560 nm	Limit of detection LOD [mg/L]	Rated value < 0.0015	Actual value —
	Recovery [%]	100 ± 10	—
	Relative standard deviation (RSD) [%]	< 2	—
Mn (257.6100 nm)	Limit of detection LOD [mg/L]	< 0.0002	—
	Recovery [%]	100 ± 10	—
	Relative standard deviation (RSD) [%]	< 1.5	—
Cu (324.7540 nm)	Limit of detection LOD [mg/L]	< 0.0010	—
	Recovery [%]	100 ± 10	—
	Relative standard deviation (RSD) [%]	< 1.5	—
Li 670.7910 nm	Limit of detection LOD [mg/L]	< 0.0025	—
	Recovery [%]	100 ± 10	—
	Relative standard deviation (RSD) [%]	< 1.5	—
	PlasmaQuant PQ 9000		
Zn 213.8560 nm	Limit of detection LOD [mg/L]	Rated value < 0.002	Actual value 0.000293
	Recovery [%]	100 ± 10	98.8

7 Completing maintenance

			Complies	Does not comply
Maintenance on the analyzer has been completed.				
The functionality and analytical performance of the device was checked in the presence of the user. The device meets its technical specification.				
Name	Function	Date	Signature	
Wipawan pathumwan	Representative Customer	11/10/2022		
Mr.Pukitja Somton	Representative Analytik Jena AG	11/10/2022		

6 Comments and objections

Comments and possible objections raised during installation and commissioning are to be recorded in writing in this section.

