Qualification Specifications and Test Points for Agilent GC Systems

Test	Set Points/ Range	Acceptance Criteria
Oven Temperature Accuracy	Temperature 1 = 40.0°C Temperature 2 = 100.0°C Temperature 3 = 230.0°C	±2°C
Oven Temperature Stability	Temperature 1 = 100.0°C	≤0.5°C
Headspace Oven Temperature Accuracy	Temperature 1 = 100°C	±4°C
Inlet Leak Test	Pressure 1 = 25 psi	≤ 2.0 psi over 5 minutes
ALS Pressure Accuracy	Pressure 1 = 25 psi	±1.2 psi
FID Flow Rate Accuracy	Air Flow Rate = 400mL/min Hydrogen Flow Rate = 30mL/min Make-up Flow Rate = 25 mL/min	Air: ± 40.0 mL/min Hydrogen: ±3.0 mL/min Make-up: ± 2.5 mL/min
TCD Flow Rate Accuracy	Air Flow Rate = 30 mL/min Make-up Flow Rate = 5 mL/min	Air: ± 3.0 mL/min Make-up: ± 1.0 mL/min
Injection Precision (ALS)	Injection Volume1 = 1µL	%RSD < 3.0%
Injection Precision (Headspace)	Injection Volume = loop,1mL, or 250uL – model dependent	%RSD < 5.0%
Carryover (Agilent HS only)	Injection Volume = 0mL	≤ 1.00%
Noise/Drift (FID/TCD)	N/A	Noise ≤ 0.15DU Drift ≤ 2.5DU/Hr
Linearity (ALS only) Optional - Additional cost	Five (5) appropriate injection volumes based on detector response and syringe size. Ex: 0.5, 1.0, 1.5, 2.0, 2.5 µl	$R^2 \geq 0.9990$

Variance Allowed

Overview for Above Mentioned Tests

1. Oven Temperature Accuracy

DESCRIPTION:

The probe is placed in the oven compartment. A calibrated digital thermometer is used to measure the temperature at three set points.

CALCULATION:

Abs (Temperature $_{\text{Set point}}$ – Temperature $_{\text{measured}}$)

UNDERLYING PRINCIPLE:

Oven temperature accuracy is important for transferring methods between systems.

2. Oven Temperature Stability

DESCRIPTION:

The probe is placed in the oven compartment. A calibrated digital thermometer is used to measure the temperature every 2 minutes for 10 minutes.

CALCULATION:

$$\%\text{RSD} = \frac{StdDev}{Average} \times 100$$

UNDERLYING PRINCIPLE:

Oven temperature stability is important for repeatability and transferring methods between systems.

3. Headspace Over Temperature Accuracy

DESCRIPTION:

A calibrated digital thermometer meter is used to measure the oven temperature.

CALCULATION:

$\text{Temperature}_{\text{measured}} = \text{Temperature}_{\text{setpoint}}$

UNDERLYING PRINCIPLE:

Temperature accuracy is important for transferring methods between systems.

4. ALS Inlet Leak Test

DESCRIPTION:

Inlet is capped. Pressure is set to 25 psi. Pressure is turned off and pressure recorded after equilibration. After 5 min pressure is recorded again.

CALCULATION:

$$Pressure\ Drop = Pressure_{Initial} - Pressure_{Final}$$

UNDERLYING PRINCIPLE:

The Leak Test is critical for transferring methods between systems and accuracy of peak area and peak response time.

5. Flow Rate Accuracy

DESCRIPTION:

Gas flow rates for Make-up, Hydrogen (only for FID) and Air are set and measured using a calibrated gas flow meter at the detector exit vent for each gas.

CALCULATION:

$$Abs(Flow\ Rate_{Set\ Point} - Flow\ Rate_{Measured})$$

UNDERLYING PRINCIPLE:

Flow rate accuracy is important for transferring methods between systems.

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6. Injection Precision

DESCRIPTION:

Sample is injected 6 consecutive times using the appropriate method based on inlet/detector configuration. Peaks are integrated and the average and %RSD for peak areas and retention times are calculated.

CALCULATION:

$$\%RSD = \frac{StdDev}{Average} \times 100$$

UNDERLYING PRINCIPLE:

Injection precision is critical for quantitative analysis accuracy.

7. Carryover

DESCRIPTION:

A blank injection is made after the six precision injections.

CALCULATION:

$$\%\ Carryover = \frac{Area_{Blank}}{Area_{Injection}} \times 100$$

UNDERLYING PRINCIPLE:

To have low or no carryover is critical for quantitative and qualitative analysis accuracy and reliability.

8. Noise/Drift

DESCRIPTION:

If the software controlling the instrument has the ability to measure noise and drift, a previous injection with a suitable area for calculating noise and drift, or a blank injection with no column is used.

CALCULATION:

ASTM noise and drift

UNDERLYING PRINCIPLE:

Noise and drift are important for quantitative and qualitative analysis accuracy and reliability. It shows the stability and sensitivity of the detector. Large noise and drift can prevent small peaks from being detected.

9. Linearity – Optional Test (Additional Cost)

DESCRIPTION:

Five injections of different injection volumes of a traceable Standard are made onto a column.

CALCULATION:

R^2 is calculated

UNDERLYING PRINCIPLE:

Linearity is important for transferring methods between systems and for quantitative and qualitative analysis accuracy and reliability.

Pre-approval of Qualification for Company Name

The undersigned person(s) approve the following:

1. The use of a validated Excel Spreadsheet to calculate the test results.
2. The delivery of tests appropriate to the actual configuration of the systems covered by the services.
3. The specifications described in this document where the setpoints and possible optional tests follow:

Standard Setpoints

Name and Role	Signature and Date

This pre-approval is applicable to the following systems.

After signing; print this page (and the next if there are variances) to PDF and return it to Analytical@Transcat.com.

Variances (if applicable)

Ignore this section if you have selected to follow the standard setpoints.

Test	Setpoint	Standard	Variance	Units
Oven Temp	Temperature 1	40	No Variance	°C
	Temperature 2	100	No Variance	
	Temperature 3	230	No Variance	
Oven Temp Stability	Temperature 1	100	No Variance	°C
Headspace Oven Temp	Temperature 1	100	No Variance	°C
Injection Precision* (ALS)	Injection Volume	1	No Variance	µL
Linearity (ALS)*	Injection Volume 1	0.5	No Variance	µL
	Injection Volume 2	1.0	No Variance	
	Injection Volume 3	1.5	No Variance	
	Injection Volume 4	2.0	No Variance	
	Injection Volume 5	2.5	No Variance	

*10-50% of syringe volume only. If the chosen volumes overload the detector, the standard may be diluted. If no suitable solvent is available to dilute the standard, the volumes will need to be adjusted with customer approval.

Optional Tests (additional cost)

Linearity ☐

Engineer completing service: sign here to acknowledge variances. Include this and previous page in report.