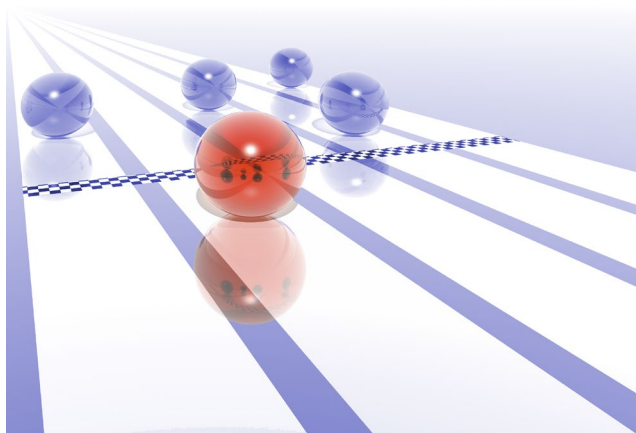


Diana 700: ASTM D86 – ASTM Proficiency Testing Program for Distillation of Motor Gasoline

Relevant for: Distillation, Gasoline

Anton Paar participated in the ASTM Proficiency Testing Program to test the gasoline sample MG 1808 with the Diana 700 and achieved convincing results.



1 Introduction

Quality and reliability of test results are essential for laboratories. The ASTM Proficiency Testing Program (PTP) is a valuable tool for laboratories and instrument manufacturers worldwide to conduct equal tests on the same material in accordance with the same test method. ASTM will evaluate the performance of the laboratories by arranging a statistical analysis of the results.

Participating in interlaboratory studies (ILS) organized by the German standardization body DIN or the European Standardization Committee EN for more than 20 years, ILS have a long history with Anton Paar.

To verify the excellent precision of Anton Paar's distillation analyzer and to extend the geographical range of these interlaboratory tests to a worldwide level, we have now participated in the ASTM Proficiency Testing Program with the Diana 700. In this PTP the gasoline sample MG 1808 was analyzed by all participating laboratories (approx. 125 laboratories).

The given standard was ASTM D86 covering the atmospheric distillation of petroleum products and liquid fuels. In general, ASTM D86 defines a method to determine quantitatively the boiling range characteristics of materials such as automotive spark ignition fuels, aviation gasolines, diesel fuels, light and middle distillates.

ASTM organizes the ILS and conducts the statistical analysis of the reported results. The results (evaporated temperature values) of the Diana 700 were found to be much better than the ASTM D86 reproducibility defining the allowed temperature range as shown in the comparison table.

This Application Report describes the distillation of gasoline performed with the distillation analyzer Diana 700 for the ASTM Proficiency Testing Program. You will get information about all accessories you need and how you have to set up your Diana 700 to obtain excellent results.

2 Accessories

To test the gasoline sample, we used the following accessories:

- **186744** Distillation flask, 125 mL
- **195872** Multi-plug
- **195234** Receiving cylinder, 100 mL
- **194531** Drip plate
- **172676** Residue cylinder, 5 mL
- **106219** Boiling stones
- **184290** Flask support board, 38 mm
- **191097** Condenser tube stopper

3 Settings

For the measurements with the Diana 700 the preset method “**ASTM D86 Group 1**” was used. Any further settings are made automatically by the instrument.

4 Sample and Instrument Preparation

- Bring the distillation flask and the sample to a temperature of below 10 °C by storing them in a refrigerator.
- Precool the receiving cylinder in the cooling chamber to a temperature between 13 °C and 18 °C.
- At test start the temperature of all equipment and sample has to be between 13 °C and 18 °C.

5 Measurement

- If required, perform a volume detector check.
- Launch the “**Easy Distill**” feature.
- Define a sample name.
- Select the method “**ASTM D86 Group 1**”.
- Clean the condenser tube by threading the cleaning wire with the felt through the tube and pulling it out.
- Select and place the flask support board in the heating chamber. Slip the stopper onto

the condenser tube. Select the distillation flask.

- Measure 100 mL of the sample in the receiving cylinder.
- Place the cylinder into the cooling chamber. Tap “**Scan Volume**”.
- Pour the sample into the distillation flask. Add boiling stones to the sample.
- Mount the multi-plug into the flask. Attach the flask to the condenser tube.
- Insert the drip plate into the receiving cylinder.
- Place the receiving cylinder into the cooling chamber if not already done so. Close the cooling chamber.
- Tap <DISTILL>.
- After the distillation, measure the residue in the flask using the 5 mL graduated cylinder or perform an automatic residue scan by tapping “**Automatic volume scanning**”. Tap <Edit> and enter the amount into the “Residue” field.

6 Test Results

The test results are the evaporated temperature values.

Comparing the values of the Diana 700 with the average values of the interlaboratory study, it became apparent that the results of the Diana 700 are clearly within the precision of the method.

Volume	IBP	5 % (v/v)	10 % (v/v)	20 % (v/v)	30 % (v/v)	40 % (v/v)	50 % (v/v)	60 % (v/v)	70 % (v/v)	80 % (v/v)	90 % (v/v)	95 % (v/v)	FBP
No. of reported results	130	124	130	125	125	125	131	126	126	124	132	124	131
Average value	36.33 °C	53.74 °C	60.49 °C	70.10 °C	79.54 °C	89.46 °C	99.50 °C	109.49 °C	120.30 °C	133.65 °C	154.02 °C	176.44 °C	212.24 °C
StdDev	1.86 °C	1.53 °C	1.10 °C	0.89 °C	0.82 °C	0.77 °C	0.70 °C	0.63 °C	0.64 °C	0.76 °C	1.39 °C	3.02 °C	1.98 °C
ASTM D86 reproducibility	4.70 °C	6.08 °C	4.60 °C	3.82 °C	3.64 °C	3.87 °C	3.78 °C	3.92 °C	4.23 °C	4.70 °C	5.92 °C	9.67 °C	7.10 °C
PTP precision	5.14 °C	4.25 °C	3.06 °C	2.48 °C	2.28 °C	2.14 °C	1.94 °C	1.74 °C	1.78 °C	2.11 °C	3.84 °C	8.38 °C	5.48 °C
TPI	0.91	1.43	1.51	1.54	1.59	1.81	1.95	2.25	2.37	2.22	1.54	1.15	1.30
Result of Anton Paar	35.00 °C	53.50 °C	60.20 °C	69.50 °C	79.10 °C	89.20 °C	99.50 °C	109.20 °C	119.30 °C	132.00 °C	153.60 °C	173.80 °C	208.70 °C
Deviation between average and Anton Paar	1.33 °C	0.24 °C	0.29 °C	0.60 °C	0.44 °C	0.26 °C	0.00 °C	0.29 °C	1.00 °C	1.65 °C	0.42 °C	2.64 °C	3.54 °C

Table 1: Test results of the Diana 700 compared to the average of the tests

Abbreviations used in the table

StdDev: Standard deviation

TPI: Test performance index = ratio of test method reproducibility and ILS precision

PTP: Proficiency testing program

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