# **Application Note:** Distillation of Motor Gasoline according to ASTM D7345 using the STARDist micro

## Introduction

Fuel distillation analysis remains a critical procedure for characterizing the volatility profile of petroleum products. Traditionally, ASTM D86 has been the industry standard for atmospheric distillation of fuels. However, evolving laboratory demands for precision, safety, and automation have led to the development of advanced micro-distillation techniques, such as those implemented in the STARDist micro, operating under ASTM D7345.
This application note evaluates the performance of the STARDist micro system in comparison to the conventional ASTM D86 automated distillation.


## STARDist micro from ORBIS

The STARDist micro is a state-of-the-art automatic atmospheric distillation analyzer, designed to meet the rigorous demands of modern laboratories. It fully complies with ASTM D7345 for automotive petroleum products and renewable fuels, including aviation fuels.

**Conformity:** ASTM D7345, EN 17306, IP 596
**Direct Correlation:** ASTM D86, ISO 3405, IP 123
**Sample volume: Only 10 mL**

**Key Features:**

- Ultra-fast analysis (sub-10 minute tests!)
- Fully automated “one-touch” operation
- Intelligent result judgment with automatic optimization
- No need to preset sample type; automatic heating profile generation
- Predictive results for distillation range and flash points
- Differential pressure flowmeter principle (no volume measurement of condensate required)
- Compact footprint, ideal for busy or space-constrained labs

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## STARDist micro Performance Validation

Figure 1 illustrates the distillation performance of both the STARDist micro and Stardist Automated systems for Motor Gasoline, benchmarked against the ASTM Proficiency Test Program (PTP) results.

Both instruments demonstrate excellent alignment with the average ASTM PTP values across the entire distillation curve.

- All measurement points from the STARDist micro and Stardist Automated systems consistently fall within the ASTM D7345 reproducibility limits.
- The STARDist micro data closely tracks the PTP average curve, verifying the method's accuracy and consistency with industry-wide results.
- Similarly, the Stardist Automated results mirror the expected distillation behavior, confirming both systems' reliability for quality control and compliance testing.

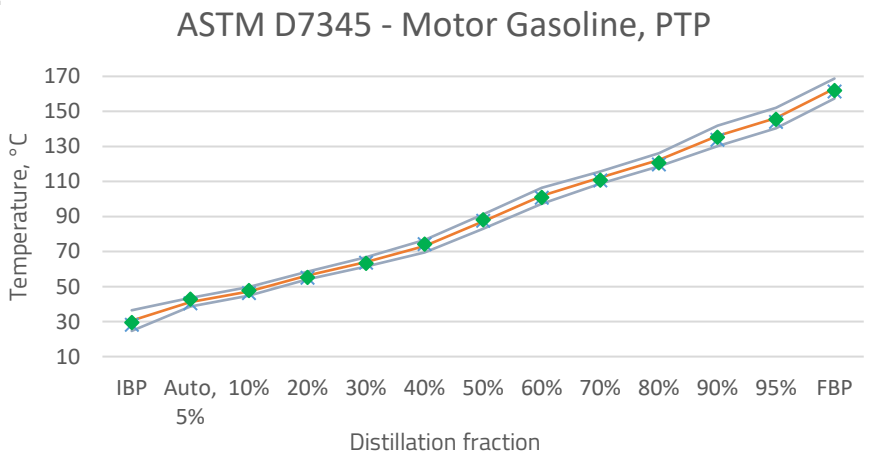


*Figure 1: Distillation graph of motor gasoline from ASTM PTP, n = 16 labs*

| Fraction (%) | IBP | Auto, 5% | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 95% | FBP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **STARDist Auto, D86 (ORBIS)** | 29,5 | 42,8 | 47,7 | 55,3 | 63,2 | 74,3 | 88,1 | 100,9 | 110,8 | 120,7 | 135,2 | 145,5 | 161,9 |
| **ASTM D86 PTP Average** *(n=136)* | 30,19 | 41,97 | 47,46 | 55,37 | 63,92 | 74,8 | 88,44 | 101,46 | 111,04 | 120,89 | 135,14 | 145,03 | 161,29 |
| **STARDist micro, D7345 (ORBIS)** | 28,1 | 40,5 | 46,3 | 55,1 | 63,7 | 74,2 | 87,5 | 100,7 | 110,6 | 119,7 | 133,8 | 144,1 | 161,4 |
| **ASTM D7345 PTP Average** *(n=16)* | 30,55 | 41,12 | 47,22 | 56,24 | 64,07 | 73,08 | 87,16 | 101,83 | 112,23 | 122,33 | 135,94 | 146,19 | 163,06 |

Results are well within the reproducibility criteria defined by ASTM D7345 and in strong correlation with the global laboratory community participating in the PTP.

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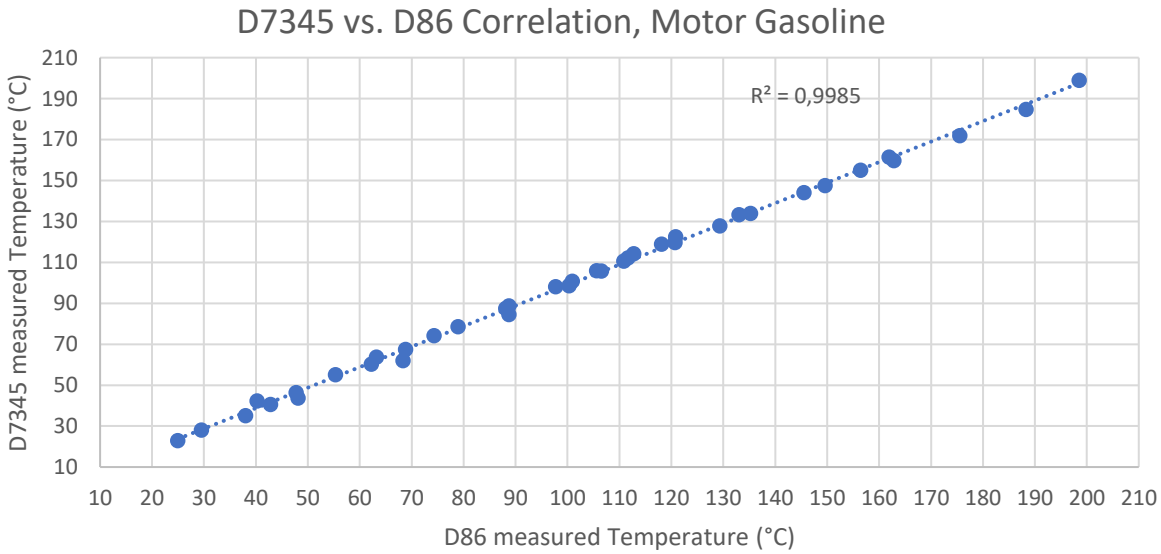
## Correlation test D7345 vs ASTM D86

To evaluate the correlation between micro-distillation (ASTM D7345) and traditional atmospheric distillation (ASTM D86), three datasets of Motor Gasoline were analyzed using both the STARDist micro and the Stardist automated distillation systems from ORBIS.

Each sample underwent parallel testing:

- STARDist micro operated according to ASTM D7345, utilizing micro-distillation with a 10 mL injection volume and fully automated procedure.
- STARDist according to ASTM D86, performing a conventional automated distillation analysis.




The resulting distillation temperatures at multiple recovery points were recorded and plotted, with D7345 measured temperatures on the Y-axis and D86 measured temperatures on the X-axis. The analysis demonstrated excellent linear correlation, as indicated by an $R^2$ value of 0.9985, confirming that the STARDist micro provides results equivalent to the traditional D86 method for Motor Gasoline.

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## Conclusion

The STARDist micro by ORBIS demonstrates robust performance in motor gasoline distillation analysis. It ensures compliance with ASTM D7345 while offering unmatched ease-of-use, safety, and efficiency. With its digital temperature control and compact design, the STARDist micro is ideally suited for fuel producers and laboratories seeking reliable and standardized distillation analysis for quality control and certification purposes.

**STARDist micro conforms to the following testing methods:**

- ASTM D7345
- EN 17309
- IP 596

**STARDist micro is in direct correlation to the following testing methods:**

- ASTM D86
- ISO 3405
- IP 123

**Key Features**

- Only 10ml of sample is required
- Volume measurement of condensate recovered is not required
- One touch operation
- Test process automation
- Intelligent result judgment
- no need to set sample type
- automatic heating profile optimization.
- Sub 10-minute sample analysis
- computer controlled distillation process


**STARDist conforms to the following testing methods:**

- ASTM D86, D850, D1078
- ISO 3405
- JIS K2254

**Key Features**

- User-Guided Start – for ensuring method compliant preparation and testing
- Pre-Scan – measurement of actual Charge Volume and Sample Temp. before test start.
- Method Validation – for real-time validation against method-specified limits
- Auto In-Heat – for automatic & dynamic initial heat settings when testing unknown products
- Optimization – for program improvement suggestions that can be implemented automatically
- Easy To Use Software – for extensive customization in a clear interface
- Network Integration – for modern connectivity and data handling solutions