

PILODIST®

laboratory & process technology

**Combined Systems for Crude Oil Analysis
(ASTM D2892 & D5236)**

PETRODIST 400

PETRODIST® 400



Processor controlled and combined crude oil distillation system for automatic operation according to **ASTM D-2892 (TBP) and ASTM D-5236 (Potstill)**

PETRODIST 400 is a combination of the basic systems

- * PETRODIST 100 CC
- * PETRODIST 200 CC

One of both systems can be operated at a time. The system enables to perform TBP- and Potstill - distillations of various crude samples according to ASTM-standards and is designed for laboratory use.

The system is equipped with a central computer control, vacuum supply and thermostate system, data storage and evaluation station as well as a fraction collector, designed to serve for both distillation systems alternatively and provides direct automatic distillation flow rate control.

The fraction/receiver changes are automatically performed according to preselected cut temperatures or in case of receiver overflowing. The fraction collector is equipped with 12 receivers. The final data and the TBP-curve in wt% and vol% are printed out after reweighing the residue.

The distillation acc. to ASTM D-5236 is fully automatic without any interruption from the beginning till the complete termination of the distillation. The system part for distillation acc. to ASTM D-2892 needs a change of receivers after each of the different pressure runs due to the design of the fraction collector to serve for both distillation systems.

The unit requires water, nitrogen, compressed air and electricity. Dry ice or liquid nitrogen is required for cold traps.

Technical Data

Equipment for ASTM D-2892

Flask size:	1, 4, 6, 10 or 20 L
Flask charge:	30 – 60 % of flask size
Operation temperature:	Up to 350° C (660° F)
Operation pressure:	Vacuum down to 1 Torr
Final cut temperature:	Up to 400° C AET (750° F)

Equipment for ASTM D-5236

Flask size:	3, 6, 10, 20 L
Flask charge:	30 – 60 % of flask charge
Operation temperature:	up to 400° C (750° F)
Operation pressure:	vacuum down to 0.1 Torr
Final cut temperature:	up to 565° C AET (1050° F)

Common equipment specification

Fraction collector:	12 receivers x 500 ml
Power consumption:	8000 W (without options)
Max. ambient temperature:	25° C
Main supply:	230 / 400 V, 50 Hz, 5-wire system, 3-phase + N + PE
Dimensions (w x h x d) (approx.):	2.30 x 2,80 x 0.90 m

Equipment according to ASTM D-2892

- 1 electrical flask heating mantle (2400 W), with temperature sensor Pt-100, and integrated stirrer drive, insulation jacket for the upper half of the flask I, including temperature sensor Pt-100
 - 2 distillation flasks, made of glass with connectors for temperature sensor, pressure drop measurement and N₂-bleed, incl. 1 flask temperature sensor Pt-100 with integrated quench coil, stainless steel
 - 1 ASTM-distillation column, with silvered high-vacuum mantle, including reflux divider in the liquid phase. Complete with packing Propak 316, separation efficiency approx. 15 theoretical plates, with solenoid coil for the reflux divider. The column dimensions are conforming to the flask size according to the ASTM-standard!!
 - 1 tower heating mantle for adiabatic operation, with temperature sensor Pt-100
 - 1 main condenser with vacuum mantle, made of glass
 - 1 distillate cooler with vacuum mantle
 - 1 pressure drop sensor with safety cooler
 - 1 vacuum sensor, with stainless steel diaphragm, range 100.0-0.1 Torr (other ranges upon request)
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Equipment according to ASTM D-5236

- 1 electrical flask heating mantle (2000 W), with temperature sensor Pt-100, and integrated stirrer drive, insulation jacket for the upper half of the flask, including temperature sensor Pt-100
- 2 distillation flasks, made of glass, with connector for temperature sensor, incl. 1 flask temperature sensor with integrated quench coil, made of stainless steel
- 1 ASTM-distillation column, 2 entrainment separators, with silvered high-vacuum mantle. Product cooler and condenser are integrated in the ASTM-column. The column dimensions are conforming to the flask size according to the ASTM-standard!!
- 1 safety cooler for the vacuum probe
- 1 head temperature sensor Pt-100, glass
- 1 column heating mantle for adiabatic operation, with temperature sensor Pt-100
- 1 vacuum sensor, with stainless steel diaphragm, range 10.0-0.01 Torr (other ranges upon request)

Common equipment for use in both distillation systems

- 1 fraction collector system, consisting of:
 - automatic fraction collector for 12 receivers for both systems (D2892 & D5236)
 - automatic distillate collecting under vacuum,
 - automatic precision volume measurement with 0,1 ml readout of distillate weight of the distillate with 0,1 gr accuracy,
 - eat up possibility of the distillate is given along the complete line system until to the bottom of final receiver.
 - a overfilling check of final receivers is automatically and controlled by the computer and software.
 - There is no electronic in fraction collector housing.
 - The temperature control of distillate cooler and fraction system will be via additional thermostat with own cooling / heating media (-28° C up to + 150° C).
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- 1 cryostat and vacuum station, consisting of:
 - 1 vacuum pump, 2-stages 18 m³/h, with throttle- and solenoid valves
 - 1 vacuum cold trap with Dewar vessel for protection of the pump made of glass
 - 1 gas trap made of glass with isolating valves
- 1 mounting frame, which is equipped with all electric and mechanic control elements, as well as lifting platform for the heating mantle and the stirrer drive, complete with all necessary holders and fastenings
- 1 **DCD control system** with computer control and all necessary peripheral components. The DCD contains the following operation and control elements:

Vacuum
Temperature
Volume follower
Fraction collector
Operating software
Personal computer
Printer

Data evaluation software for input of all weights (gross, tare) to the PC, with storage of all data on hard disk. Manipulation of the data, evaluation of the results and printout of the yield and the distillation-curve. The data can be recalled at any time. Printout of TBP-curve in wt% and vol%. incl. electronic precision balance

OPTIONS

UPS-System

Uninterruptible power supply for computer, processor and balance. The UPS-systems protects the system from data loss up to 20 minutes in case of power failure. (230 V, 50 Hz, 2000 VA - other voltages and capacities upon request).

Fire Extinguisher

Automatic fire fighting system with a steel cylinder with 10 kg of CO₂. UV-sensors for monitoring the system, control electronics and pyrotechnically valve. Shut-down of the system in case of alarm.

Gas Detector

Monitoring of hydrocarbons escaping from the system by means of a gas detector. In case combustible gases are detected, alarm will be given. When the alarm is ignored, the distillation will be switched off after a pre- selected time.

Hydrogen Sulphide Alarm

Monitoring of hydrogen sulphide escaping from the system. Sensor for detection of hydrogen sulphide with digital display of concentration from 1 to 20 ppm. Alarm signal adjustable from 1 ppm. Alarm will be given without shut down of the system.

Hydrogen Sulphide Trap

System ventilation via washing bottle for neutralisation the hydrogen sulphide without neutralisation solution.

4.2 PETRODIST 400 CC

Processor controlled combined crude oil distillation system for fully automatic operation according to ASTM D-2892 (TBP) and ASTM D-5236 (Potstill). PETRODIST 400 CC is a combination of the following systems:

- PETRODIST 100 CC (ASTM D-2892)
- PETRODIST 200 CC (ASTM D-5236)

Both systems can operate at the same time (simultaneously) in fully automatic, uninterrupted and unattended mode. The data evaluation software provides also a combined TBP-curve for both systems.

Compact design with control system and safety items for unattended operation. No operator intervention and no intermediate stops are required.

All necessary accessories will be supplied together with the system. The installation requires water, nitrogen, compressed air and electricity.

The system enables to perform TBP- and Potstill - distillations of various crude samples according to ASTM-standards and is designed for laboratory use.

The system is equipped with a central computer control, vacuum supply and thermostate system, data storage and evaluation station as well as a fraction collector, designed to serve for both distillation systems simultaneously and provides direct automatic distillation flow rate control.

The fraction/receiver changes are automatically performed according to preselected cut temperatures or in case of receiver overfilling. Both systems are equipped with individual fraction collectors to allow simultaneous operation of both systems. The final data and the TBP-curve in wt% and vol% are printed out after reweighing the residue.

The unit requires water, nitrogen, compressed air and electricity. Dry ice or liquid nitrogen is required for cold traps.

1. Distillation acc. to ASTM D-2892 (PETRODIST 100 CC)

The distillation performs fully automatically from the gas cut (IBP) to the pre-selected end point without any interruptions and any interventions throughout all different pressure levels. The yield calculation refers to the weight of the flask charge.

Data station for overriding parameter input as well as for display and print-out of all operation parameters, distillation results and TBP-curve.

The system is modularly constructed and is expandable for water removal and other options.

The TBP-curve can be printed out in weight- and/or volume-percent. All necessary accessories will be supplied together with the system. The installation requires water, nitrogen, compressed air and electricity

Technical data

Flask size:	1, 4, 6, 10 or 20 L
Flask charge:	30 – 60 % of flask size
Operation temperature:	up to 350° C (AET 420°C)
Operation pressure:	vacuum down to 1 Torr
Fraction collector:	20 receivers
Power consumption:	4500 W (without options)
Max. ambient temperature:	25° C
Mains supply:	230 / 380 V, 50 Hz, 5-wire system, 3-phase + N + PE
Dimensions (w x h x d):	1,45 x 3.50 x 1,0 m

The PETRODIST 100 CC system consists of:

- 1 system basis (mounting frame) for the assembly of all parts, equipped with all system specific electric, mechanic and pneumatic control elements, as well as lifting platform for the insulating mantle heating bath, including all necessary holders and fastenings
 - 1 heating bath with insulating mantle for 10 l flask with temperature sensor Pt-100 and integrated stirrer drive, insulation jacket for the upper half of the flask, heated with 0.25 W/cm² including temperature sensor
 - 2 distillation flasks 10 l, made of glass, with connecting nozzle for temperature sensor, pressure drop measurement and N₂-bleed, with 1 flask temperature sensor with 1 quench cooler, made of stainless steel
 - 1 distillation column 15 theoretical plates, including take off divider in the liquid phase with silvered high – vacuum mantle. Complete with packing, Propak 316, solenoid coil for the take off divider, with head temperature sensor Pt-100 with NS 14.5 cone,
 - 1 column heating mantle for adiabatic operation, with built-in temperature sensor,
 - 1 main condenser with vacuum mantle, made of glass, cooling surface: 0.1 m²
 - 1 distillate cooler with vacuum mantle
 - 1 distillate weighing system with electronic precision balance for continuous recording of fraction weights under vacuum, with integrated balance receiver 1000 ml
 - 1 discharge system with blockpot (intermediate receiver), servo valves and syringe system
 - 1 fraction collector with 20 receivers, made of glass and sealed with septa
 - 1 pressure drop sensor with protective cooler
 - 1 vacuum probe, independent of the kind of gas, with stainless steel diaphragm, range 100.0-0.1 Torr (other ranges upon request)
 - 1 cryo-vac station, equipped with:
 - 1 vacuum pump, 2-stages 16 m³/h, with throttle- and solenoid valves for vacuum stabilisation
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- 2 vacuum cold traps with Dewar vessels for protection of the pump
- 1 gas trap (pressure-proof up to 3 bar) with isolating valves and Dewar vessel
- 1 cryostat for cooling of the main condenser and for cooling of the peripheral parts

2. Distillation acc. to ASTM D-5236 (PETRODIST 200 CC)

The distillation performs fully automatically from the start to the pre-selected or detected end point without any interruption. The distillate volume is automatically recorded by means of an integrated volume follower system. The volume is measured separately in every individual receiver. The unit does not contain any intermediate receiver to avoid a reblend of the distillate. The volume calculation is expressed as percentage corresponding to the weight and the volume of the flask charge or total recovery. The distillation curve is printed out in weight and volume percent. The fraction changes are carried out automatically, alternatively according to a pre-selected boiling temperature or distillate volume or when the receivers are filled up. The vacuum-tight fraction collector contains 12 receivers with a capacity related to the flask size. The boil up rate is controlled according to a pre-selected distillation rate in ml/min. An accurate vacuum control guarantees the required stability of the distillation pressure. All necessary accessories will be supplied together with the system. The installation requires water, nitrogen, compressed air and electricity.

Technical Data

Flask size:	3, 6, 10, 20 L
Flask charge:	30 – 60 % of flask size
Fraction collector:	12 receivers
Operation temperature:	up to 400° C (565°C AET)
Operation pressure:	vacuum down to 0.1 Torr
Power consumption:	5000 W
Max. ambient temperature:	25° C
Mains supply:	230 / 400 V, 50 Hz, 5-wire system, 3-phase + N + PE
Dimensions (w x h x d):	1.60 x 2.20 x 0.90 m

The PETRODIST 200 CC system consists of:

- 1 system basis (mounting frame) for the assembly of all parts, equipped with all system specific electric, mechanic and pneumatic control elements, as well as lifting platform for the insulating mantle heating bath, including all necessary holders and fastenings
 - 1 heating bath with insulating flask mantle with temperature sensor Pt-100, integrated stirrer drive and air cooling, insulation jacket for the upper half of the flask, including temperature sensor
 - 2 distillation flasks, made of glass, with connecting nozzle for temperature sensor, with 1 flask temperature sensor with 1 quench cooler, made of stainless steel
 - 1 distillation head, 2 entrainment separators with silvered high-vacuum mantle. Product cooler and condenser are melted to the head. Head temperature sensor Pt-100, protective cooler for the vacuum probe
 - 1 column heating mantle for adiabatic operation, with built-in temperature sensor
 - 1 vacuum-tight fraction collector for automatic operation, for 12 receivers, with volume follower system and IR-heater for the receivers,
 - 1 vacuum probe, independent of the kind of gas, with stainless steel diaphragm, temperature stabilised, range 10.0-0.01 Torr (other ranges upon request)
 - 1 vacuum cold trap for CO₂-operation for protection of the vacuum pump, including Dewar vessel
 - 1 vacuum pump, 2-stages, 16 m³/h, complete with oil filling and vacuum control device with solenoid control valve and throttle servo-valve and bypass valve
 - 1 compact thermostat, operation range -30° to +150°C,
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3. Central control and evaluation station

The central control system is based on a multifunctional serial bus system integrated into the system basis and connected to a PC with the windows based operation software to operate either each system individually or both systems simultaneously.

The software allows a comfortable overview and input of all parameters, as well as the automatic creation of the final data tables and curves. All Parameters can be changed during the operation process and saved and recalled at any time. The final data tables, curves and the combination of distillation data's prepared under the standards ASTM-D2892 and ASTM-D5236 will be created automatically in Microsoft Excel.

The password protected service area gives the user an easy possibility to do calibration and maintenance work.

It consists of:

- 2 independent serial bus control systems (integrated into the system basis)
 - 2 computer systems with flat screen and color printer.
 - 1 software package with operating software and microsoft excel.
 - 1 electronic Balance
 - 1 set connection- and power cables
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