

Distillation at Atmospheric Pressure - ADU 4 (automatic)

ASTM D 86, ASTM D 1078, ISO 3405, DIN 51751 (obs.), IP 123, IP 195, JIS K2254, NF M07-002 (obs.)

Product group(s): Distillation

User group(s): Airports & Aviation, Biodiesel, Diesel, Fuel, Jet Fuel, Regulatory Authorities, Solvent

Scope: For the examination of motor gasolines, aviation gasolines, aviation turbine fuels, special boiling point spirits, naphthas, white spirits, kerosenes, gas oils, distillate fuel oils, solvents and similar petroleum products.

The idea of this apparatus with built-in Fire-Extinguisher is to create a modular system, which can be up-graded on demand with Tempering Unit, PC or Printer.

Its characteristics are:

- Volume detection by solid light barrier system
- Fire-Extinguisher (CO₂ or N₂).
- Only an external cooling system of small capacity is demanded
- Small receiver tempering chamber!
- General supply of PC-Software ADUcon & ADUpro
- LIMS connection is possible

- **Low Price - High Value**
- **Software included**
- **Ultra-High Heater**
- **Long-Life Heater**
- **Safety-Heater-Rods reduce burn-risks**

Recommended Extensions:

- **Computer** (MS Windows® compatible) for the ADU is highly recommended. Programs will be automatically stored, temperature/volume spread sheets and graphics are available.
- **Printer** (if no PC is used) for a numerical printout of results. The temperatures of 5 vol.% and the important values will be printed without graphics.
- **Dry-Point Detection** requires sensor according flask size
- **Spare Part Set** for approx. 12 months operation

Required Accessories:

- **Glassware** for other standards than ASTM D 86 (Group 1-4)
- **Dry-Point Sensor**
- **External Tempering System**
to assure an ADU working range of 0 to +80 °C available as:
automatic & ADU 4 controlled version (with RS232-interface) for distillation group 0-4 or group 1-4 & solvents
manual, low cost version for distillation group 1-4 & solvents



ADU 4 - Automatic Distillation Unit

With the included accessories suitable for:

- **Petroleum Products at Atmospheric Pressure**

With further accessories suitable for:

- **Industrial Aromatic Hydrocarbons**
- **Volatile Organic Liquids**

Supplied with:

- 1 Basic **glassware set** according ASTM D 86 (Group 1-4)
- 1 **ADUcon-software** to allow a computer-supported operation
- 1 **ADUpro-software** as PC extension module with additional functions (e.g. the simultaneous run of up to 6 ADU-units with 1 PC)

To be composed of:

- **Distillation Unit**
(with Fire-Extinguisher or
with Fire-Extinguisher & Dry-Point Detection)
- **Cooler** (boiling group related)
- **Glassware** according ASTM D 86 (Group 0)
- **Glassware** according ASTM D 850 - ASTM D 1078 - IP 195 (Solvents)
- **Dry-point sensor** (depending on the flask size)
- **Data Evaluation Unit** (computer-set or serial printer!)

Technical Data

ADU-Unit without accessories:

Dimensions (W x H x D): 400 x 550 x 450 mm, Weight: approx. 20 kg

External Tempering System

Available circulation coolers assure an ADU working range of 0 to +80 °C at environmental temperatures of +10 to +35 °C:

automatic & ADU controlled: (with RS232-interface)

In connection with an ADU 4 controlled tempering system, the chamber tempering values can be pre-programmed to change during the process (e.g. from group 0 to 4).

for distillation group 0-4 (circulator 25-0242)

with an operating span -28 to +150 °C

for distillation group 1-4 & solvents (circulator 25-0240)

with an operating span of -10 to +100 °C

manual, low cost version:

for distillation group 1-4 & solvents (circulator 25-0395)

with an operating span of -10 to +100 °C

NOTE: A customer owned tempering system could be used, if it is able to provide a 0°C-cooling capacity of: approx. 200 W for group 0 or approx. 70 W for group 1-4. For automatic data transfer a serial RS232-interface (0-modem) is required.

Main Unit

11-0542



ADU 4 - Automatic Distillation Unit with Fire-Extinguisher

Petroleum Products at Atmospheric Pressure: ASTM D 86 - IP 123 - ISO 3405 (DIN 51751 - NF M07-002) - JIS K2254

With further accessories suitable for:

Industrial Aromatic Hydrocarbons: ASTM D 850

Volatile Organic Liquids: ASTM D 1078 - IP 195

Consisting of:

Heating cabinet with built-in fire-extinguisher, microprocessor controlled electric heater (1200 W), temperature probe and jack for height adjustment of flask. Condenser tube with water jacket for tempering by external thermostatic circulator. Recovery cabinet with light barrier detection. High-grade stainless steel housing with two-color powder coating, digital display, keys and RS232 interface.

Supplied with:

1 **ADUcon-software** to allow a computer-supported operation

1 **ADUpro-software** as PC extension module with additional functions:

- *Heat-Parameter Optimizer* (If necessary, this software recommends more adequate heat-parameters for the next test run automatically.)
 - *Pre-selected Temperature-Spread-Sheet* (additionally to the Volume-Spread-Sheet the selection of nearly all temperature-values (corrected temp.) and the corresponding volume recovered is possible)
 - *Support of solvent distillation* acc. ASTM D 850 & D 1078 (with a preset parameter library for different solvents)
 - *Connection and simultaneous run of up to 6 ADU-units* with 1 PC (if not enough RS232-ports available, we recommend a USB-Hub)
- Note: Each ADU-unit requires a separate ADUpro-Software installation.

1 **glassware set** according ASTM D 86 (Group 1-4)

(1 flask 125 ml, 2 glass-ceramic plates with hole 1x Ø 38 & 1x Ø 50 mm)

1 **PTFE-stopper** 19/26 to hold the temperature probe

1 **stopper** to connect flask condenser tube

1 graduated **cylinder** 100 ml with metal base

1 **drip tongue**

1 **cleaning coil** for the condenser tube

1 **test sample** (300 ml bottle)

1 **insulating hose set** for cooler connection

1 **connection set**

(data cable for cooler, 0-modem cable, RS232-adaptor, USB-converter)

Power supply: 230 V, 50 Hz

11-0543 ADU 4 - Automatic Distillation Unit with Fire-Extinguisher

Like 11-0542 but:
Power supply: 115 V, 60 Hz

11-1542 ADU 4 - Automatic Distillation Unit with Dry-Point Detection and Fire-Extinguisher



Petroleum Products at Atmospheric Pressure: ASTM D 86 - IP 123 - ISO 3405 (DIN 51751 - NF M07-002) - JIS K2254

With further accessories suitable for:
Industrial Aromatic Hydrocarbons: ASTM D 850
Volatile Organic Liquids: ASTM D 1078 - IP 195

Like 11-0542 but: A sensor for dry-point detection must be ordered separately (acc. to flask size). Further it requires external CO₂ or N₂ supply between 6 and 12 bar.

Power supply: 230 V, 50 Hz

11-1543 ADU 4 - Automatic Distillation Unit with Dry-Point Detection and Fire-Extinguisher

Like 11-1542 but:
Power supply: 115 V, 60 Hz

Options & Accessories

11-0546 Glassware Set (Group 0-4)
ASTM D 86 - ISO 3405 - IP 123 - JIS K2254



Consisting of:
1 flask 100 ml, neck 19/26 (group 0)
1 glass-ceramic plate with hole Ø 32 mm (group 0)
1 flask 125 ml, neck 19/26 (group 1-4)
1 glass-ceramic plate with hole Ø 38 mm (group 1-4)
1 glass-ceramic plate with hole Ø 50 mm (group 1-4)

11-0524 Distillation Flask, 125 ml, ground socket (NS 19/26)
with thermometer immersion-mark, side pipe Ø 7 mm,
quartz glass (for temperatures above 370 °C)
(ASTM E133/B, Engler-shape)

11-0588 Dry-Point Sensor fits 100/125 ml flask

11-0547 Glassware Set (Solvents)
ASTM D 850 - ASTM D 1078 - IP 195



Consisting of:
1 flask 200 ml, neck 19/26
1 glass-ceramic plate with hole Ø 25 mm
1 glass-ceramic plate with hole Ø 32 mm
1 glass-ceramic plate with hole Ø 38 mm
1 glass-ceramic plate with hole Ø 50 mm

11-0596 Cylinder HR, 100 ml, borosilicate glass, graduated
(complete with tube, metal base and O-rings)

11-0587 Dry-Point Sensor fits 200 ml flask

11-0575 Anti-Dazzle Screen



(for dazzling-free dry-point observations)

11-0571

Calibration Set - Volume-Detection

Consisting of:
1 Burette (50:0.1 ml)
1 Burette-holder set



11-0582

Calibration-Set - Temperature

Consisting of:
1 Calibration-Resistor-Set
1 Thermometer IP 39C (official certified)



11-0590

Reference Liquid for Distillation of Mineral Oil Products (Boiling Characteristics)

ASTM D 86 - ISO 3405

Initial Boiling Point: approx. 160°C,
Final Boiling Point: approx. 360°C
Data evaluated by International Industrial Round Robin Test.

Aluminum bottle / content 255 ml.

11-0591

Reference Liquid for Distillation of Gasoline (Unleaded)

ASTM D 86

Certified Value: approx. 30 °C - 184 °C, 250 ml

11-0593

Reference Liquid for Distillation of Diesel

ASTM D 86

Certified Value: approx. 163 °C to 362 °C, 250 ml

11-0545

Boiling-Stones, pack of 20 g

against the boiling retardation
Note: Do not use with dry-point detection.



11-0597

O-Ring Set (Chemraz), solvent resistant

(used for condenser tube stopper and flask-neck)

25-0803

Computer with Monitor & Graphic-Printer

allows to connect up to 6 instruments
(detailed specifications upon request)
Power supply: 230 V, 50 Hz

11-0598

USB-Hub Device (4-ports) with power supply (EU-plug)

to connect 4 instruments by USB 2.0 to one PC USB-port, (Verified for petrotest® units)

11-0594

USB-Hub Device (4-ports) with power supply (US-plug-adaptor)

25-0282

Impact Printer (mono)

for single sheets & continuous paper
to record data like test results, duration of test, etc. (instead of a PC)

Supplied with: 2 data cables (9-pin 25-0304, USB 25-0918), 1 ink ribbon (black)

Technical Data:

Line spacing: 80 characters per line (10 cpi)
Page size : 257 x 364 mm (sheet), 254 x 558.8 mm (roll)
Ports: serial (9-pin), USB (1.1)
Dimensions: 37 x 28 x 16 cm (WxDxH)
Weight: 5 kg



Power supply: 220/240 V, 50/60 Hz

25-0283

Impact Printer

Like 25-0282 but:

Power supply: 110/130 V, 50/60 Hz

25-0240

Circulator (external & internal heating & cooling)

For heating & cooling of instruments without circulation pump and / or for tempering applications directly in the bath.



Consisting of:

Cooler with stainless steel bath. Thermostat with digital display, splash-proof keypad, integrated heater, pump, RS232-interface, over/under-temperature & low-level protection, adjustable pump-pressure, cooling control.

Supplied with: 1 bath cover, 1 drain tap

Note: Insulated hose-set is recommended.

Technical Data:

Working range: -28 to +200 °C (at +5 to +40 °C ambient temp.)

Display / Resolution: LED / 0.1 °C

Control: PID

Heater capacity: 2000 W

Cooling capacity: 260 W at +20 °C

Pump-Pressure capacity: 11-16 l/min, 450 mbar

Bath opening: 12 x 14 x 14 cm (WxDxH)

Safety class / Bath fluid: 3 / FL (Flammable Liquids possible)

Volume: 4.5 l

Sockets for: hose (Ø 8 / 10 mm), solenoid valve

Dimensions / Weight: 23 x 42 x 61 cm (WxDxH), 31 kg

Power supply: 230 V, 50/60 Hz, EU-plug

25-0241

Circulator (external & internal heating & cooling)

Like 25-0240 but:

Heater capacity: 1000 W

Power supply: 115 V, 60 Hz, US-plug

25-0242

Circulator (external & internal heating & cooling)

For heating & cooling of instruments without circulation pump and / or for tempering applications directly in the bath.



Consisting of:

Cooler with stainless steel bath. Thermostat with digital display, splash-proof keypad, integrated heater, pump, RS232-interface, over/under-temperature & low-level protection, adjustable pump-pressure, cooling control.

Supplied with:

1 bath cover, 1 drain tap

Note: Insulated hose-set is recommended

Technical Data:

Working range: -35 to +200 °C (at +5 to +40 °C ambient temp.)

Display / Resolution: LED / 0.1 °C

Control: PID

Heater capacity: 2000 W

Cooling capacity: 450 W at +20 °C

Pump-Pressure capacity: 11-16 l/min, 450 mbar

Bath opening: 18 x 12 x 15 cm (WxDxH)

Safety class / Bath fluid: 3 / FL (Flammable Liquids possible)

Volume: 8 l

Sockets for: hose (Ø 8 / 10 mm)

Dimensions / Weight: 31 x 42 x 64 cm (WxDxH), 37 kg

Power supply: 230 V, 50 Hz, EU-plug

25-0243


Circulator (external & internal heating & cooling)

Like 25-0242 but:


Heater capacity: 1000 W

Power supply: 115 V, 60 Hz, US-plug

Spare Parts

	<p>11-0574 Spare Parts Set - ASTM D 86 (Group 1-4) for approx. 1 year consisting of: 10x 11-0515 (125 ml flask), 2x 11-0554 (100 ml cylinder), 1x 11-0558 (5 stoppers), 1x 11-0559 (temperature probe), 1x 11-0567 (drip tongue)</p>
<p>11-0514</p>	<p>Distillation Flask, 100 ml, ground socket (NS 19/26) with thermometer immersion-mark, side pipe Ø 7 mm, (ASTM E133/A, Engler-shape)</p>
<p>11-0515</p>	<p>Distillation Flask, 125 ml, ground socket (NS 19/26) with thermometer immersion-mark, side pipe Ø 7 mm, (ASTM E133/B, Engler-shape)</p>
<p>11-0524</p>	<p>Distillation Flask, 125 ml, ground socket (NS 19/26) with thermometer immersion-mark, side pipe Ø 7 mm, quartz glass (for temperatures above 370 °C) (ASTM E133/B, Engler-shape)</p>
<p>11-0517</p>	<p>Distillation Flask, 200 ml, ground socket (NS 19/26) with thermometer immersion-mark, side pipe Ø 7 mm, (ASTM E133/C, Barret-shape)</p>
<p>11-0567</p>	<p>Drip Tongue</p>
<p>11-0554</p>	<p>Cylinder, 100 ml, borosilicate glass, graduated (complete with tube, metal base and O-rings)</p>
<p>11-0596</p>	<p>Cylinder HR, 100 ml, borosilicate glass, graduated (complete with tube, metal base and O-rings)</p>
<p>11-0555</p>	<p>Cylinder Tube, borosilicate glass, graduated</p>
<p>11-0556</p>	<p>Cylinder Metal Base, (fits 11-0555) with 3 O-rings</p>
<p>11-0595</p>	<p>Cylinder Metal Base HR (fits 11-0555) with 3 O-rings (top one high resistant)</p>
<p>11-0557</p>	<p>O-Rings for metal base 11-0556 inside, pack of 10</p>
<p>11-0573</p>	<p>O-Rings for metal base 11-0556 outside, pack of 10</p>
<p>11-0572</p>	<p>Dismantling Device for cylinder metal base</p>
<p>11-0135</p>	<p>Support Board, center hole Ø 25 mm (1") glass ceramics (150 x 150 x 4 mm)</p>
<p>11-0136</p>	<p>Support Board, center hole Ø 32 mm (1 ¼") glass ceramics (150 x 150 x 4 mm)</p>
<p>11-0137</p>	<p>Support Board, center hole Ø 38 mm (1 ½")</p>

glass ceramics (150 x 150 x 4 mm)

11-0138	Support Board, center hole Ø 50 mm (2") glass ceramics (150 x 150 x 4 mm)
11-0561	Electric Heater Assembly, 1200 W (incl. 1 heater rod with & 1 w/o sensor)
11-0039	Heater Rod, 600 W, 115/230 V without temperature sensor
11-0579	Heater Rod, 600 W, 115/230 V with integrated temperature sensor
11-0578	Heating-Temperature Sensor (NiCr-Ni)
11-0559	Sample-Temperature Probe (Pt-100)
11-0521	Stopper, PTFE (NS 19/26 / bored Ø 6 mm) with 2 O-rings as temperature probe support
11-0549	Cleaning Coil for condenser tube
11-0558	Stopper PEEK (Ø 12 / bored Ø 6 mm), pack of 5 with 3 O-rings, high-temperature resistant (to connect condenser tube with distillation flask side pipe)
	
11-0584	O-Ring Set for stopper 11-0558 <u>Consisting of:</u> 1 outer- & 2 inner - O-rings (recommended for ASTM D 850 - ASTM D 1078)
11-0564	Burette, 50:0.1 ml
11-0565	Burette-Holder
23-0010	O-Rings, Viton, 34 x 3 mm, pack of 10
26-0037	Thermometer IP 39C Range: -1 to +38 : 0.1 °C (officially certified)
25-0229	Hose-Set, insulated (Ø 10 mm, 2x 2 m, incl. fittings)

Order Guideline

Minimum equipment:	1x ADU, 1x Test set, 1x Cooler
Spares (approx. 1 year):	1x Spare part set
Additional requirements:	Water supply for cooler, CO ₂ / N ₂ -supply (6 to 12 bar) for fire-extinguisher