



NORMAG - LABORATORY GLASSWARE



## DISTILLATION APPARATUS

According to the modular construction system, numerous vacuum distillation apparatus can be assembled with flasks and condensers, adapters and receivers from our micro program system. For treating of substance volumes less than 100 ml, apparatus are preferred as offered in this catalogue.

The ground joints of the common Barchit and Claisen apparatus are made as standard ground joint NS 19/26 since liquid pile-up in the neck of the flask can occur in standard ground joints NS 14/23 due to the too high vapour speed.

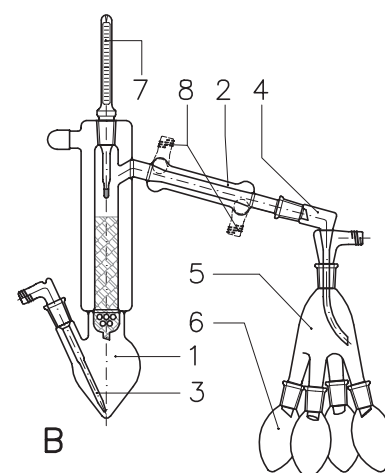
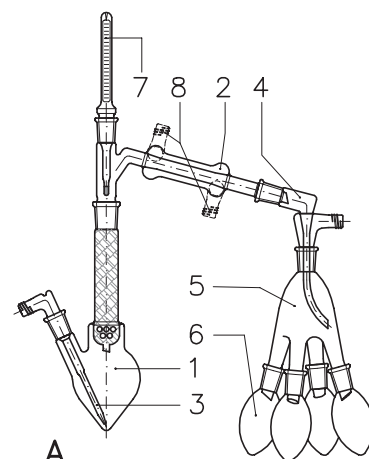
### Barchit-apparatus

 Design B has a silver coated insulating jacket.

Capacity (ml)	Description	Design	Catalogue No.
25	Micro Barchit apparatus (complete)	A	GSG 01098
100	Barchit apparatus (complete)	A	GSG 01097
100	Barchit apparatus (complete) with silver coated insulating jacket	B	LSG 01101

#### Delivery

Part No.	Qty.	Description	Catalogue No.	Catalogue No.	Catalogue No.
			Design A 25 ml	Design A 100 ml	Design B 100 ml
1	1	Boiling flask with sealed column	GSG 01098A	GSG 01097A	LSG 01100
2	1	Liebig link	GSG 01098B	GSG 01097B	GSG 01097B
3	1	Boiling capillary	GSG 01098C	GSG 01097C	GSG 01097C
4	1	Adapter	GSG 01098D	GSG 01097D	GSG 01097D
5	1	Manifold receiver	GSG 01098E	GSG 01097E	GSG 01097E
6	4	Receiver	GSG 01098F	GSG 01097F	GSG 01097F
7	1	Thermometer	GSG 01098G	GSG 01097G	GSG 01097G
8	4	Threaded hose connection	SAS 00749 01	SAS 00749 01	SAS 00749 01



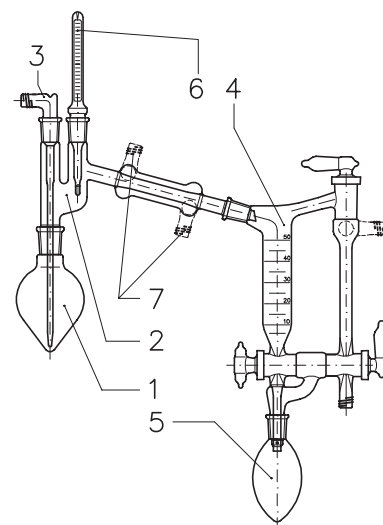
## DISTILLATION APPARATUS

### Claisen apparatus

Capacity (ml)	Description	Catalogue No.
25	Micro Claisen apparatus (complete)	GSG 01109
100	Claisen apparatus (complete)	GSG 01105

Delivery

Part No.	Qty.	Description	Catalogue No.	
			25 ml	100 ml
1	1	Boiling flask	GSG 01109A	GSG 01105A
2	1	Claisen link	GSG 01109B	GSG 01105B
3	1	Boiling capillary	GSG 01109C	GSG 01105C
4	1	Anschütz-Thiele-receiver	GSG 01109D	GSG 01105D
5	1	Receiver	GSG 01109E	GSG 01105E
6	1	Thermometer	GSG 01109F	GSG 01105F
7	5	Threaded hose connection adapter	SAS 00749 01	SAS 00749 01



## DISTILLATION APPARATUS

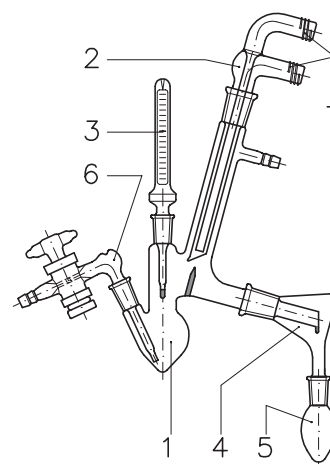
### Micro Micro short path apparatus

The micro-micro short path apparatus with sealed boiling flask has a capacity of 10 ml. An exact adjustment of the drain time is effected by the sealed glass cutting edge. The apparatus is fitted with a vacuum connection with hose connection D 8. The boiling capillary is fitted with a hose connection D 8 and one single way stopcock 1 NS.

Capacity (ml)	Description	Catalogue No.
10	Micro Micro short path distillation apparatus (complete)	SAA 14000

#### Delivery

Part No.	Qty.	Description	Catalogue No.
1	1	Micro Micro short path apparatus	SAA 14001
2	1	Cold finger	SAA 14002
3	1	Thermometer with NS 10/19, Installation length 50 mm	ALH 09066 04
4	1	Cow distributor flat	SAA 14003
5	3	Flask	KOK 00920 02
6	1	Boiling capillary with single way stopcock 1NS	GSG 01053
7	2	Threaded hose connection adapter	SAS 00749 01



## DISTILLATION APPARATUS

### Micro distillation apparatus

These micro distillation apparatus have a column with silver coated insulating jacket, a sealed condensation receiver and an Anschütz-Thiele receiver. Two glass threads GL 14 serve as connections for the cooling water.

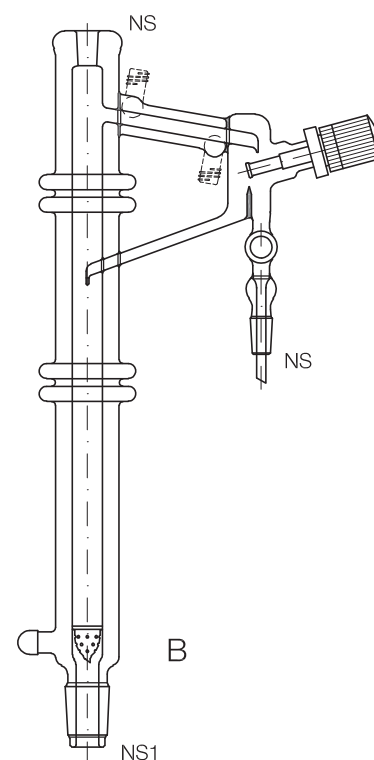
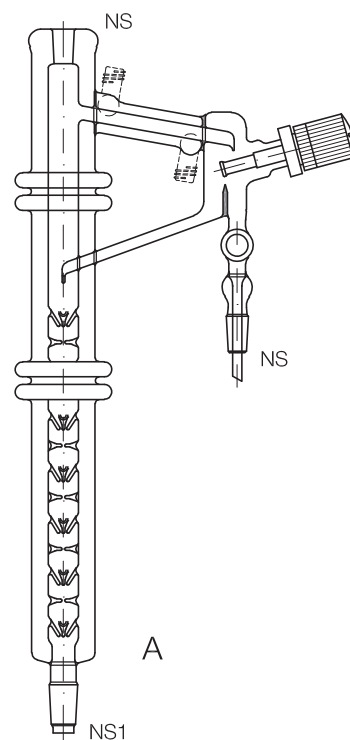
Design A is fitted with a conical ground joint cone NS 19/26 as basic ground joint, conical ground joint cone NS 14/23 as drain ground joint and conical ground joint socket for thermometer NS 14/23.

Design B is fitted with a jacketed conical ground joint cone NS 29/32 as basic ground joint, conical ground joint cone NS 14/23 as drain ground joint and conical ground joint socket for thermometer NS 14/23.

The micro distillation apparatus is offered:

- with packed column or
- with Vigreux column.

Design	NS	NS1	Column type	Catalogue No.
B	14/23	19/26	Packed column	SAA 08095
B	14/23	29/32	Packed column	SAA 08097
A	14/23	19/26	Vigreux column	SAA 08096
A	14/23	29/32	Vigreux column	SAA 08098



All ground joints are also available in other standard sizes, e.g. US-standard.

## ROTATION PERFORATOR

Besides distillation and sublimation, crystallisation, filtration and purification by absorption, extraction is an important method of enrichment, separation and purification of solid and liquid substances. It makes use of differences in behaviour towards solvents without chemical reactions taking place. The basic principle of these extraction apparatus is that the solvent is continuously evaporated in a boiling flask, condenses in a reflux condenser and drops onto the material to be extracted. From there it returns to the boiling flask, charged with the extracted substances. Dissolved substances can also be selectively separated from liquids with suitable solvents. All liquid-liquid extractions are based on the premise that the solvents used are not miscible with one another or only to a negligible extent. It is important for the solvent droplets to be well distributed to ensure that the phases are in intimate contact; however, this contact is very incomplete in traditional perforators. Therefore, the circulation of the extraction solvent through the material to be extracted has to be repeated frequently, which takes a lot of time. The rotation perforator according to H. Ludwig has a rotating distributor in the extraction vessel which is driven through a magnetic coupling. The extraction solvent fed from the condenser to the distributor is forced by centrifugal force through small holes in the distributor ring as fine droplets into the liquid to be extracted, thus ensuring that solvent is well dispersed and thoroughly mixed with the liquid to be extracted. The fact that there is close contact between the extraction and the liquid to be extracted over an adequate dwell time produces optimum exchange of matter. Since the liquid to be extracted also rotates in the vessel, the finely dispersed substance does not reach the separator zone of the perforator until it has been in the liquid to be extracted for an extended dwell time and continuously returns to the boiling flask from which the solvent leaving the extracted substance is fed back to the extraction circuit by being evaporated again. Liquid-liquid extraction is performed much more quickly in the rotation perforators according to Ludwig than any other traditional equipment.

All ground joints are also available in other standard sizes, e.g. US-standard.

## Rotation perforator according to Ludwig

☞ These rotation perforator are used for liquid-liquid extractions for specific light solvents.

We offer six designs of rotation perforators:

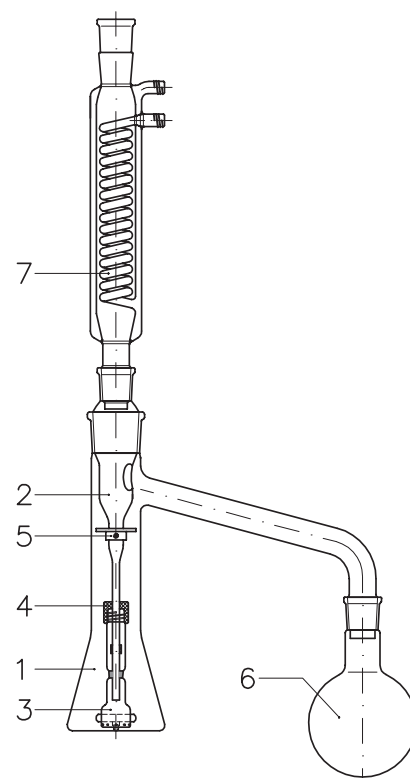
- A with 100 ml
- B with 300 ml
- C with 500 ml
- D with 1000 ml
- E with 2000 ml
- F with 5000 ml

### Design A -100 ml-

Capacity (ml)	Description	Catalogue No.
100	Rotation perforator according to Ludwig (complete)	SAA 02069 00

Delivery

Part No.	Qty.	Description	Catalogue No.
1	1	Extraction vessel with NS 29/32 and 29/32, capacity 100 ml	SAA 02069 01
2	1	Inlet resp. suction tube with NS 29/32 and bearing	SAA 02069 02
3	1	Rotary distributor with magnet, pivot nipple and bearing	SAA 02069 03
4	1	Anti-slip lock	SAA 02069 04
5	1	Separating ring with support ring	SAA 02069 05
6	1	Flask, round bottom cap. 100 ml	KOK 01024 05
7	1	Jacketed condenser 160 mm	GSG 01073 01



## Design B -300 ml-

Capacity (ml)	Description	Catalogue No.
300	Rotation perforator according to Ludwig (complete)	SAA 02070 00

Delivery

Part No.	Qty.	Description	Catalogue No.
1	1	Extraction vessel with NS 45/40 and NS 29/32, capacity 300 ml	SAA 02070 01
2	1	Inlet resp. suction tube with NS 45/40 and NS 29/32, and bearing	SAA 02070 02
3	1	Rotary distributor with magnet, pivot nipple and bearing	SAA 02070 03
4	1	Anti-slip lock	SAA 02070 04
5	1	Separating ring with support ring	SAA 02070 05
6	1	Flask, round bottom, capacity 500 ml	KOK 01024 07
7	1	Jacketed condenser 250 mm	GSG 01073 02

## Design C -500 ml-

Capacity (ml)	Description	Catalogue No.
500	Rotation perforator according to Ludwig (complete)	SAA 02071 00

Delivery

Part No.	Qty.	Description	Catalogue No.
1	1	Extraction vessel with NS 45/40 and NS 29/32, capacity 500 ml	SAA 02071 01
2	1	Inlet resp. suction tube with NS 45/40 and NS 29/32, and bearing	SAA 02071 02
3	1	Rotary distributor with magnet, pivot nipple and bearing	SAA 02071 03
4	1	Anti-slip lock	SAA 02071 04
5	1	Separating ring with support ring	SAA 02071 05
6	1	Flask, round bottom, capacity 500 ml	KOK 01024 07
7	1	Jacketed condenser 250 mm	GSG 01073 02

## Design D -1000 ml-

Capacity (ml)	Description	Catalogue No.
1000	Rotation perforator according to Ludwig (complete)	SAA 02072 00

Delivery

Part No.	Qty.	Description	Catalogue No.
1	1	Extraction vessel with NS 45/40 and NS 29/32, capacity 1000 ml	SAA 02072 01
2	1	Inlet resp. suction tube with NS 45/40 and NS 29/32, and bearing	SAA 02072 02
3	1	Rotary distributor with magnet, pivot nipple and bearing	SAA 02072 03
4	1	Anti-slip lock	SAA 02072 04
5	1	Separating ring with support ring	SAA 02072 05
6	1	Flask, round bottom, capacity 1000 ml	KOK 01024 08
7	1	Jacketed condenser 250 mm	GSG 01073 02

## Design E -2000 ml-

Capacity (ml)	Description	Catalogue No.
2000	Rotation perforator according to Ludwig (complete)	SAA 02073 00

Delivery

Part No.	Qty.	Description	Catalogue No.
1	1	Extraction vessel with NS NS 60/46 and NS 29/32, capacity 2000 ml	SAA 02073 01
2	1	Inlet resp. suction tube with NS 60/46 and NS 29/32, and bearing	SAA 02073 02
3	1	Rotary distributor with magnet, pivot nipple and bearing	SAA 02073 03
4	1	Anti-slip lock	SAA 02073 04
5	1	Separating ring with support ring	SAA 02073 05
6	1	Flask, round bottom, capacity 2000 ml	KOK 01024 09
7	1	Jacketed condenser 400 mm	GSG 01073 03

All ground joints are also available in other standard sizes, e.g. US-standard.

## ROTATION PERFORATOR

### Design F -5000 ml-

Capacity (ml)	Description	Catalogue No.
5000	Rotation perforator according to Ludwig (complete)	SAA 02074 00

Delivery

Part No.	Qty.	Description	Catalogue No.
1	1	Extraction vessel with NS 60/46 and NS 29/32, capacity 5000 ml	SAA 02074 01
2	1	Inlet resp. suction tube with NS 60/46 and NS 29/32, and bearing	SAA 02074 02
3	1	Rotary distributor with magnet, pivot nipple and bearing	SAA 02074 03
4	1	Anti-slip lock	SAA 02074 04
5	1	Separating ring with support ring	SAA 02074 05
6	1	Flask, round bottom, capacity 6000 ml	KOK 01024 11
7	1	Jacketed condenser, 400 mm	GSG 01073 03

## Rotation perforators according to Ludwig

☞ These rotation perforator are used for liquid-liquid extraction for specific heavy solvents.

We offer five designs of rotation perforators:

- A with 150 ml
- B with 500 ml
- C with 1000 ml
- D with 2000 ml
- E with 5000 ml

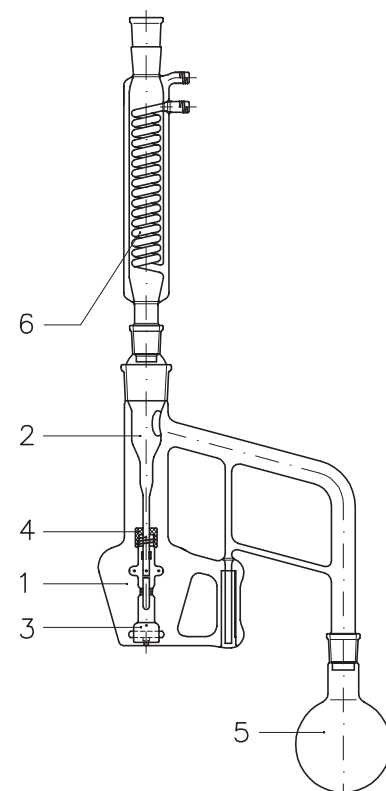
### Design A -150 ml-

Capacity (ml)	Description	Catalogue No.
150	Rotation perforator according to Ludwig (complete)	SAA 02080 00

Delivery

Part No.	Qty.	Description	Catalogue No.
1	1	Extraction vessel with NS 29/32 and NS 29/32, capacity 150 ml	SAA 02080 01
2	1	Inlet resp. suction tube with NS 29/32 and NS 29/32, and bearing	SAA 02080 02
3	1	Rotary distributor with magnet, pivot nipple and bearing	SAA 02080 03
4	1	Anti-slip lock	SAA 02080 04
5	1	Flask, round bottom, capacity 250 ml	KOK 01024 06
6	1	Jacketed condenser, 250 mm	GSG 01073 02

All ground joints are also available in other standard sizes, e.g. US-standard.





## Design B -500 ml-

Capacity (ml)	Description	Catalogue No.
500	Rotation perforator according to Ludwig (complete)	SAA 02081 00

Delivery

Part No.	Qty.	Description	Catalogue No.
1	1	Extraction vessel with NS 45/40 and NS 29/32, capacity 500 ml	SAA 02081 01
2	1	Inlet resp. suction tube with NS 45/40 and NS 29/32, and bearing	SAA 02081 02
3	1	Rotary distributor with magnet, pivot nipple and bearing	SAA 02081 03
4	1	Anti-slip lock	SAA 02081 04
5	1	Flask, round bottom, capacity 500 ml	KOK 01024 07
6	1	Jacketed condenser, 250 mm	GSG 01073 02

## Design C -1000 ml-

Capacity (ml)	Description	Catalogue No.
1000	Rotation perforator according to Ludwig (complete)	SAA 02082 00

Delivery

Part No.	Qty.	Description	Catalogue No.
1	1	Extraction vessel with NS 45/40 and NS 29/32, capacity 1000 ml	SAA 02082 01
2	1	Inlet resp. suction tube with NS 45/40 and NS 29/32, and bearing	SAA 02082 02
3	1	Rotary distributor with magnet, pivot nipple and bearing	SAA 02082 03
4	1	Anti-slip lock	SAA 02082 04
5	1	Flask, round bottom, capacity 1000 ml	KOK 01024 08
6	1	Jacketed condenser, 250 mm	GSG 01073 02

## Design D -2000 ml-

Capacity (ml)	Description	Catalogue No.
2000	Rotation perforator according to Ludwig (complete)	SAA 02083 00

Delivery

Part No.	Qty.	Description	Catalogue No.
1	1	Extraction vessel with NS 60/46 and NS 29/32, capacity 2000 ml	SAA 02083 01
2	1	Inlet resp. suction tube with NS 60/46 and NS 29/32, and bearing	SAA 02083 02
3	1	Rotary distributor with magnet, pivot nipple and bearing	SAA 02083 03
4	1	Anti-slip lock	SAA 02083 04
5	1	Flask, round bottom, capacity 2000 ml	KOK 01024 09
6	1	Jacketed condenser, 400 mm	GSG 01073 03

## Design E -5000 ml-

Capacity (ml)	Description	Catalogue No.
5000	Rotation perforator according to Ludwig (complete)	SAA 02084 00

Delivery

Part No.	Qty.	Description	Catalogue No.
1	1	Extraction vessel with NS 60/46 and NS 29/32, capacity 5000 ml	SAA 02084 01
2	1	Inlet resp. suction tube with NS 60/46 and NS 29/32, and bearing	SAA 02084 02
3	1	Rotary distributor with magnet, pivot nipple and bearing	SAA 02084 03
4	1	Anti-slip lock	SAA 02084 04
5	1	Flask, round bottom, capacity 6000 ml	KOK 01024 11
6	1	Jacketed condenser, 400 mm	GSG 01073 03

All ground joints are also available in other standard sizes, e.g. US-standard.

## CHROMATOGRAPHY COLUMNS

The chromatography is an analytic and preparative technique for separation and purification of organic substances as well as inorganic and bio-chemical substances.

It can be described as a separation technique, which is proceeded by differentiated moving of the solved substances under influence of a moving solvent.

Transparent glass columns are used as separating columns to observe the separation.

After filling the glass column with the adsorption media (e.g. aluminium oxide - $\text{Al}_2\text{O}_3$ -) it is very important to fill the column evenly with the solvent to reach a successful separation; air bubbles and uneven feeding must be avoided. The flow rate must be watched and should not be to high (3 to 4 ml/min in a column of 40 cm).

Chromatography columns are available in 3 basic forms.

Basic form 01: four piercing for taking a glass wool pad

Basic form 02: Filter disc, drain funnel shaped

Basic form 03: Filter disc, drain with very small death volume

The basic forms 01, 02, 03 are available in the following variables of porosity:

Variable 04: Filter disc porosity D0

Variable 05: Filter disc porosity D1

Variable 06: Filter disc porosity D2

Variable 07: Filter disc porosity D3

Variable 08: Filter disc porosity D4

Variable 09: PTFE-spindle valve

Variable 10: Beaded rim

Variable 11: Conical ground joint socket NS 14/23

Variable 12: Conical ground joint socket NS 29/32

Variable 13: Single way stopcock

Variable 15: Tempering jacket

Variable 16: Drain tube, bent

Variable 17: Drain capillary tube

Variable 18: Drain tube, bent with glass thread GL 14 and PTFE-squeeze screwing for attachment of fine hoses

Variable 19: Drain with NS-cone and vacuum connection

Variable 21: Inner diameter 10 mm

Variable 22: Inner diameter 15 mm

Variable 23: Inner diameter 20 mm

Variable 24: Inner diameter 25 mm

Variable 25: Inner diameter 30 mm

Variable 26: Inner diameter 40 mm

Variable 27: Inner diameter 50 mm

Variable 28: Inner diameter 60 mm

Variable 29: Filling height 200 mm

Variable 30: Filling height 300 mm

Variable 31: Filling height 400 mm

Variable 32: Filling height 600 mm

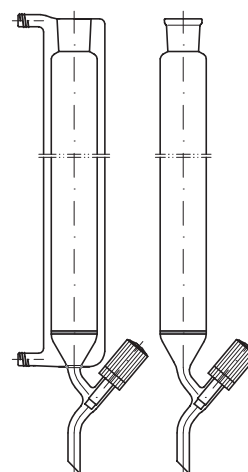
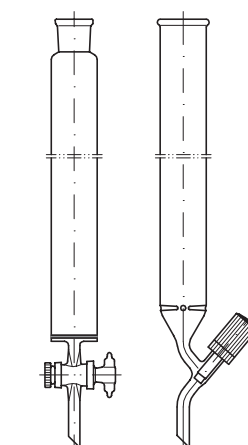
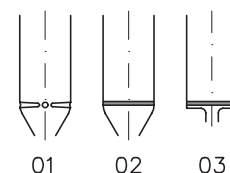
Variable 33: Filling height 800 mm

Variable 34: Filling height 1000 mm

Variable 35: Filling height 1500 mm

Variable 36: Filling height 2000 mm

Other inner diameters and filling heights are available on request.



All ground joints are also available in other standard sizes, e.g. US-standard.

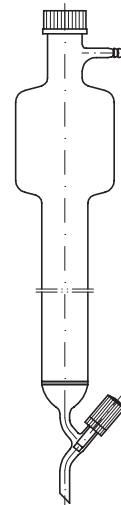
## CHROMATOGRAPHY COLUMNS

### Chromatography columns according to Bösherz

This chromatography column is suitable for working under slight overpressure (up to 0.5 bar). The storage vessel is integrated in the chromatography column and is fitted with a screw cap. At the top of the column a connection is located which can be used for pressure reducing.

This chromatography column is equipped with QVF-PTFE-spindle valve.

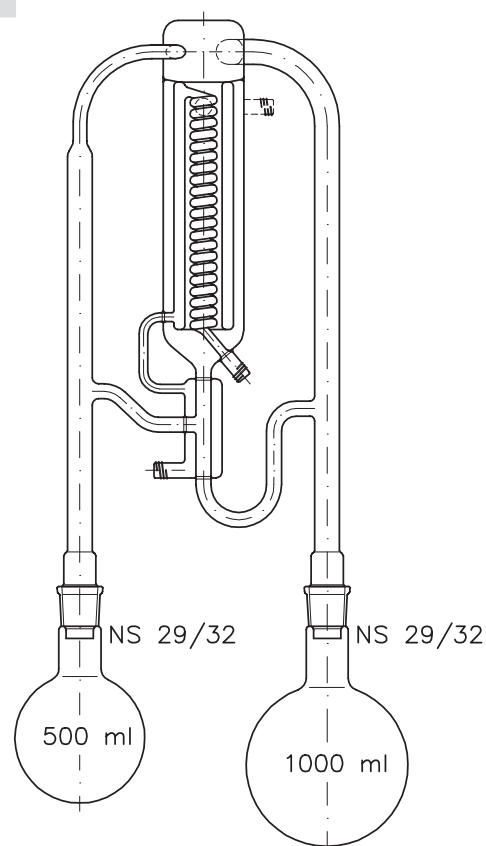
Capacity of vessel (ml)	Filter porosity	SPV	Catalogue No.
500	0	3	LSG 02060 01
1000	0	6	LSG 02060 02



## APPARATUS FOR SIMULTANEOUS STEAM DISTILLATION-EXTRACTION (COMPLETE)

This apparatus is suitable for insulation of high boiling substances which are very low water soluble and with a relative big molecular weight in relation to water. For extractions solvents can be used, whose specific weight is higher than 1. Before starting the distillation in the both flasks, the U-shaped tube is filled via the inlet tube with water or, if the specific weight of the organic solvent is higher than 1, the tube is filled with the solvent. The flask, connected with the distilling tube, contains the liquid with the specific higher weight.

**Catalogue No. SAA 02043 00**



## SOXHLET EXTRACTORS

Soxhlet extractors have a siphon which fully drains the filled extraction thimble in intervals. Inside the common Soxhlet extractor takes place a partial heat up but it is negligible. When a substance in coldness in fractionating extractions is selectively soluble, must be cold extracted. For this case, the Soxhlet cold extractor will be fitted with a cooling jacket. For extractions at higher temperatures, the Soxhlet heat extractor is used. The extraction thimble is heated with the vapour and drained with a siphon in intervals. The apparatus are fitted with jacketed condensers. The effectiveness of these condensers provides a high operating standard. A drying tube can be assembled on the upper part of the condenser.

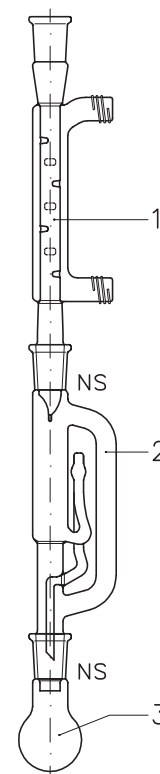
☞ Please note that the nominal capacity of the flask must be always as twice as big as the capacity of the extractor.

### Micro Micro Soxhlet Extractor (complete)

Capacity (ml)	NS	Catalogue No.
5	14/23	GSG 02023 00

Delivery

No.	Qty.	Description	Catalogue No.
1	1	Special condenser for Micro Micro Soxhlet-Extractor	GSG 02023 01
2	1	Micro Micro Soxhlet-Extractor	GSG 02023 02
3	1	Flask, round bottom, 10 ml, NS 14/23	KOK 01020 02



All ground joints are also available in other standard sizes, e.g. US-standard.

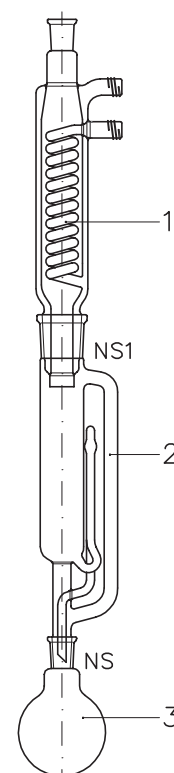
## SOXHLET EXTRACTORS

### Micro Soxhlet extractor (complete)

Capacity (ml)	NS	NS1	Catalogue No.
50	14/23	29/32	GSG 02022 00

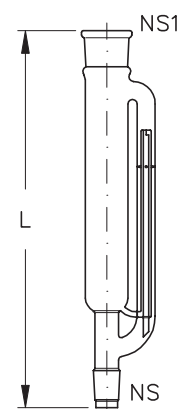
Delivery

No.	Qty.	Description	Catalogue No.
1	1	Special condenser for Micro Soxhlet-Extractor	GSG 02022 01
2	1	Micro Soxhlet-Extractor	GSG 02022 02
3	1	Flask, round bottom, 100 ml, NS 14/23	KOK 01020 05



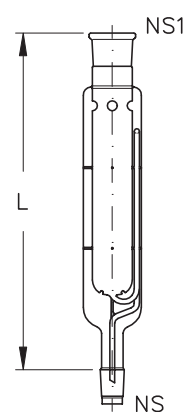
### Soxhlet extractors

Capacity (ml)	L	NS	NS1	Catalogue No.
70	270	29/32	34/35	GSG 02019 17
100	270	29/32	45/40	GSG 02019 18
150	325	29/32	45/40	GSG 02019 19
250	375	29/32	45/40	GSG 02019 20
500	405	29/32	60/46	GSG 02019 22
1000	525	29/32	71/51	GSG 02019 23
2000	490	29/32	100/60	GSG 02019 24



### Soxhlet heat extractors

Capacity (ml)	L	NS	NS1	Catalogue No.
100	300	29/32	45/40	GSG 02020 06
150	355	29/32	45/40	GSG 02020 07
250	410	29/32	45/40	GSG 02020 08
500	420	29/32	60/46	GSG 02020 09
1000	540	29/32	71/51	GSG 02020 10

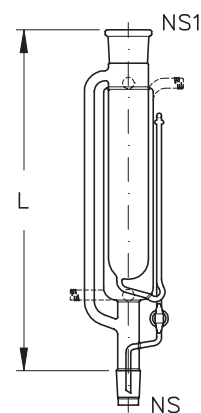


All ground joints are also available in other standard sizes, e.g. US-standard.

## SOXHLET EXTRACTORS

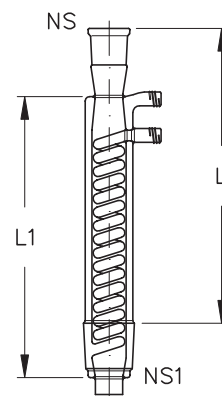
### Soxhlet cold extractors

Capacity (ml)	L	NS	NS1	Catalogue No.
100	320	29/32	45/40	LSG 11080 11
150	375	29/32	45/40	LSG 11080 12
250	430	29/32	45/40	LSG 11080 13
500	440	29/32	60/46	LSG 11080 14
1000	560	29/32	71/51	LSG 11080 15



### Jacketed condenser for Soxhlet extractors

L	L1	NS	NS1	Catalogue No.
235	220	29/32	34/35	GSG 02019 09
270	260	29/32	45/40	GSG 02019 10
320	315	29/32	60/46	GSG 02019 12
315	315	29/32	71/51	GSG 02019 13
305	315	29/32	100/60	GSG 02019 14



All ground joints are also available in other standard sizes, e.g. US-standard.

## SOLVENT CIRCULATING APPARATUS (COMPLETE)

Especially in the preparative organo-metallic chemistry absolute water-free solvents are used. The solvents are first treated with drying chemicals as calcium chloride or phosphorous pentoxide to bind the main amount of water. To separate the water more efficiently, the pre-dried solvents are subduced to the reflux over sodium wire or Litiu-malanat. The reflux condenser, completely made of glass, is replaced by a metal spiral heat exchanger. The metal spiral heat exchanger is suspended into the jacket tube via a conical ground joint socket NS 29/32 and is delivered either copper nickel-plated or stainless steel made. The lateral upper outlet with conical ground joint socket NS 14/23 serves for ventilation and can accommodate an overpressure valve or a drying tube.

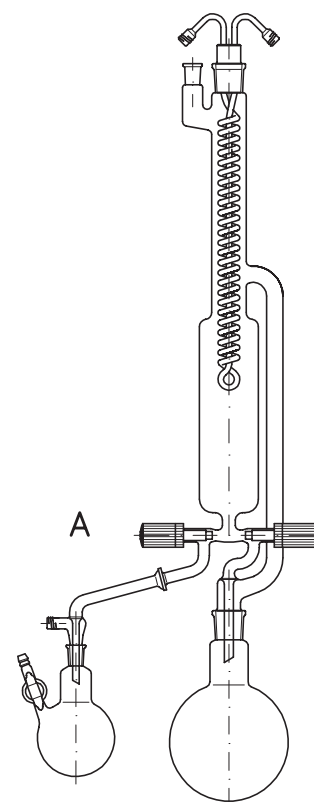


Available in three designs:

Design A + B according to Bösherz are fitted with standard ground joints NS 29/32 and NS 14/23, PTFE-double spindle valve SPV 6, complete with lateral connection with grease-free Rotulex-connection and spherical joint clamp RS 19/9, metal spiral heat exchanger, cooling water connection: metal thread GL 14 and two threaded hose connections GL 14.

Design A is also available with graduation.

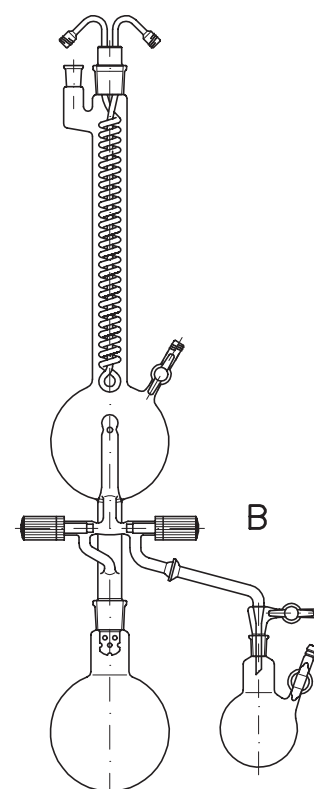
Design B is additionally fitted with standard stopcock with PTFE-key (bore 3 mm) for sampling.



Supply vessel (ml)	Material of the heat exchanger Length: 300 mm	Design	Catalogue No.
500	Copper - nickel-plated	A	LSG 08801 01
500	Copper - nickel-plated	B	LSG 08806 01
500	Stainless steel, No. 1.4571	A	LSG 08801 03
500	Stainless steel, No. 1.4571	B	LSG 08806 03
1000	Copper - nickel-plated	A	LSG 08801 02
1000	Copper - nickel-plated	B	LSG 08806 02
1000	Stainless steel, No. 1.4571	A	LSG 08801 04
1000	Stainless steel, No. 1.4571	B	LSG 08806 04

Both designs are delivered with flask, round bottom and nitrogen flask.

Supply vessel (ml)	Nitrogen flask capacity (ml)	Flask, round bottom capacity (ml)	Catalogue No.
500	250	-	GSG 01020H 06
1000	500	-	GSG 01020H 07
500	-	1000	KOK 01024 08
1000	-	2000	KOK 01024 09



All ground joints are also available in other standard sizes, e.g. US-standard.



## SOLVENT CIRCULATING APPARATUS (COMPLETE)

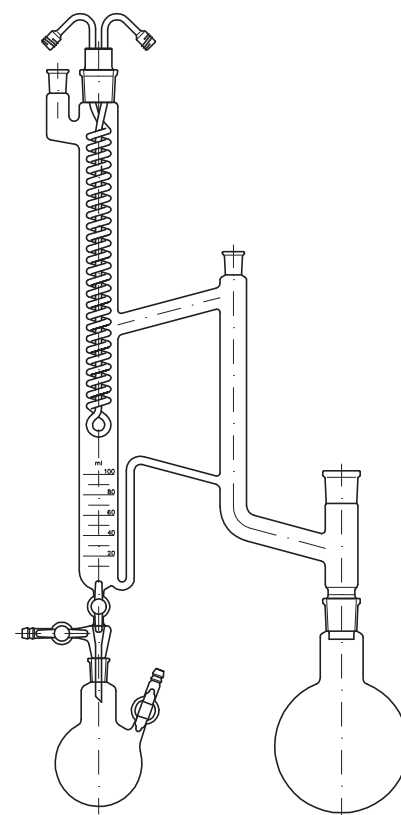
### Model "Mainz"

Fitted with standard ground joints NS 14/23 and NS 29/32 and two standard stopcocks (bore 3 mm) and PTFE-key. The supply vessel has a capacity of 100 ml, complete with metal spiral heat exchanger, cooling water connections with metal thread GL 14 and two threaded hose connections GL 14.

Supply vessel (ml)	Material of heat exchanger Length: 300 mm	Catalogue No.
100	Stainless steel, No. 1.4571	LSG 08805 02

Delivered with one Nitrogen flask and one round bottom flask.

Supply vessel (ml)	Nitrogen flask capacity (ml)	Flask, round bottom capacity (ml)	Catalogue No.
100	250	-	GSG 01020H 06
100	-	2000	KOK 01024 09



All ground joints are also available in other standard sizes, e.g. US-standard.

## APPARATUS FOR EXTRACTIVE STEAM DISTILLATION (COMPLETE)

This apparatus is particularly suitable for exact determination of the content of ethereal oils in plant parts. Oils, extracted from the plant parts (buds, flowers, blossoms, fruits, seeds, leaves, twigs, herbs, bark, timbers, roots, nodules, bulbs) are differentiated in fat oils and ethereal oils. The ethereal oils are complicated mixtures of alcohol, aldehydes, ketones, ester, oxides, lactose, sulfurous and nitrogenous connections, terpenes and other still unknown connections. For determination of the content of ethereal oils in plant parts, the apparatus for extractive steam distillation has proved worthwhile in practice. The ethereal oil is extracted out of the precise weight-in substance in the extraction vessel with steam, condenses at the descending condenser and is separated from the water in the measuring tube. Ethereal oils with density lower or bigger than 1 can be exactly captured. A solution of the water soluble parts of the distilled oil is avoided through storage of a saturated sodium bromide solution in the measuring tube of the apparatus. The water flows back in the boiling flask over a reflux pipe which is lockable with a glass needle valve and the water will be further used for extraction process. The distillation time takes approx. 3 hours from the beginning of the boiling. The capacity of the extracted oil is exactly determined in the measuring tube. The percentage weight proportion of ethereal oils is ascertained through the determination of the density of the extracted oil with the help of a precision weighing pipette according to Pregl, a special pycnometer for density determination of little volumes.

$$\frac{100 \times \text{determined density} \times \text{oil volume [ml]}}{\text{Extract weight of contents [g]}} = \% \text{ ethereal oil}$$

Since the results of ethereal oils can enormously differ in subject to the used substance, the apparatus are available with measuring tubes in different sizes (0.8, 4 and 10 ml).

**Catalogue No. SAA 02110 00**

Delivery:

### Part 1 (measuring tube)

- conical ground joint cone NS 29/32
- Czako-stopcock with hollow glass key, bore 3 mm
- glass thread GL 14
- glass needle valve, right angle
- measuring tube, graduated

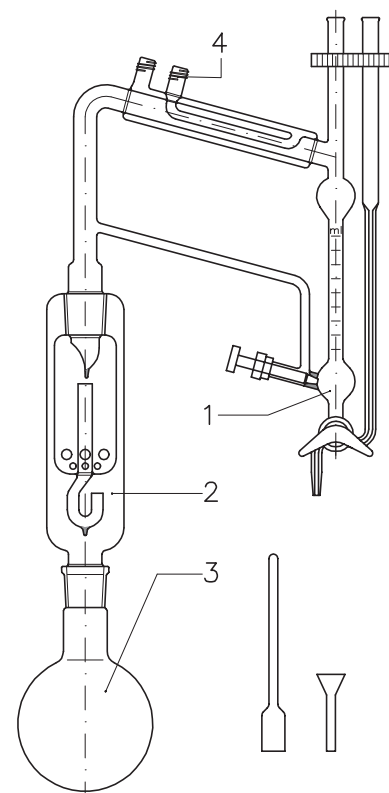
### Part 2 (Extraction thimble, Extraction vessel)

- conical ground joint socket NS 29/32
- conical ground joint cone NS 29/32
- complete with funnel
- safety tube and wire netting made of stainless steel

### Part 3 (flask, round bottom, socket NS 29/32)

### Part 4 (threaded hose connection GL 14)

Capacity of measuring tube (ml)	Part	Catalogue No.
0.8 (sealed, for reinforce)	1	SAA 02110 01
4	1	SAA 02110 11
10	1	SAA 02110 21
-	2	SAA 02111 01
-	3	KOK 01024 07
-	4	SAS 00749 01



All ground joints are also available in other standard sizes, e.g. US-standard.

## WATER DETERMINATION APPARATUS (COMPLETE)

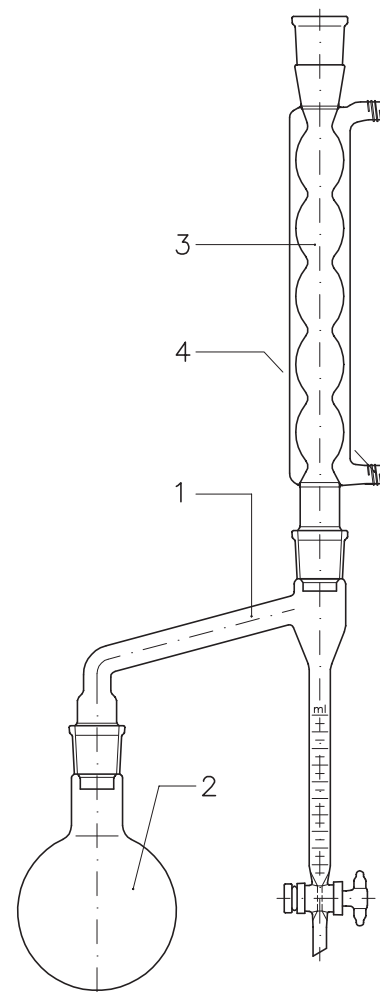
This apparatus serves for easy and quick determination of a combined water volume in a solid product.

The product enriched with water is so strongly heated in the round bottom flask, that the water with product turns in the steam phase and condenses at the bulb condenser. The condensed water/product mixture is sampled in a graduated tube in which the water deposits on the bottom. Consequently an exact volume determination of the extracted water can be made.

**Catalogue No. SAA 02026 00**

Delivery

Part No.	Qty.	Description	Catalogue No.
1	1	Measuring tube with conical ground joint socket NS 29/32 with conical ground joint cone NS 29/32 Standard stopcock with bore 3 mm Capacity 10 ml and ml-graduation 1/10	SAA 02026 01
2	1	Single neck flask, capacity 500 ml, socket NS 29/32	KOK 01024 07
3	1	Allihn condenser with conical ground joint socket NS 29/32 with conical ground joint cone NS 29/32 Jacket length: 25 cm Cooling water connections: glass thread GL 14	GSG 01067
4	2	threaded hose connector GL 14	SAS 00749 01



All ground joints are also available in other standard sizes, e.g. US-standard.

## WATER SEPARATOR (COMPLETE)

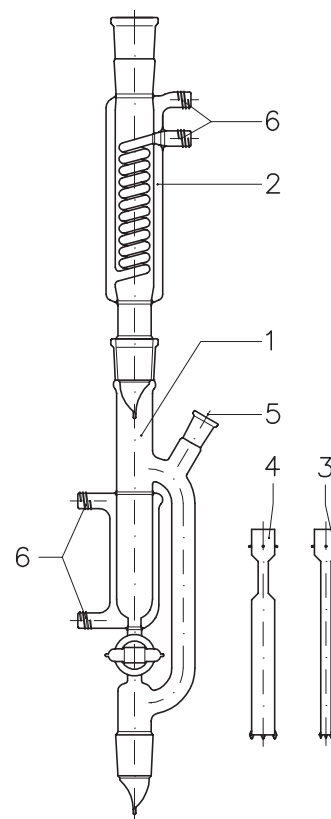
Water separator serve for continuous elimination of water, also in bigger concentrations out of organic liquids for drying, changing of the chemical balance. This separation is mainly reached by distillation with a tow medium.

The condensate, draining from the reflux condenser, separates in two phases in the water separator which is usually equipped with a column. To ease this phase separation, the separating vessel is surrounded with a cooling medium. The progress of chemical reactions, which are run under water formation, can be observed with the volume of the separated water. The continuous elimination of water out of the reaction balance causes in such cases a considerably shorted reaction time and the result can be increased e.g. in condensation, acetalisation and esterification.

**Catalogue No. LSG 08012 00**

Delivery

Part No.	Qty.	Description	Catalogue No.
1	1	Head with cooling medium, consisting of: - Conical ground joint socket NS 29/32 - Conical ground joint cone NS 29/32 - Connection for temperature measuring: Conical ground joint socket NS 14/23 - Standard stopcock NS 4 (PTFE-key) - Connection for cooling water: glass thread GL 14	LSG 08012 01
2	1	Jacketed condenser	GSG 01073 01
3	1	Inset for drag particles, lighter than water	LSG 08012 02
4	1	Inset for drag particles, density up to 1.6	LSG 08012 03
5	1	Thermometer with conical ground cone NS 14/23	ALH 09060 01
6	4	Threaded hose connection GL 14	SAS 00749 01



All ground joints are also available in other standard sizes, e.g. US-standard.

## FLUORINE DETERMINATION APPARATUS (COMPLETE)

With this fluorine determination apparatus, a quick determination of fluorine is possible within approx. one hour.

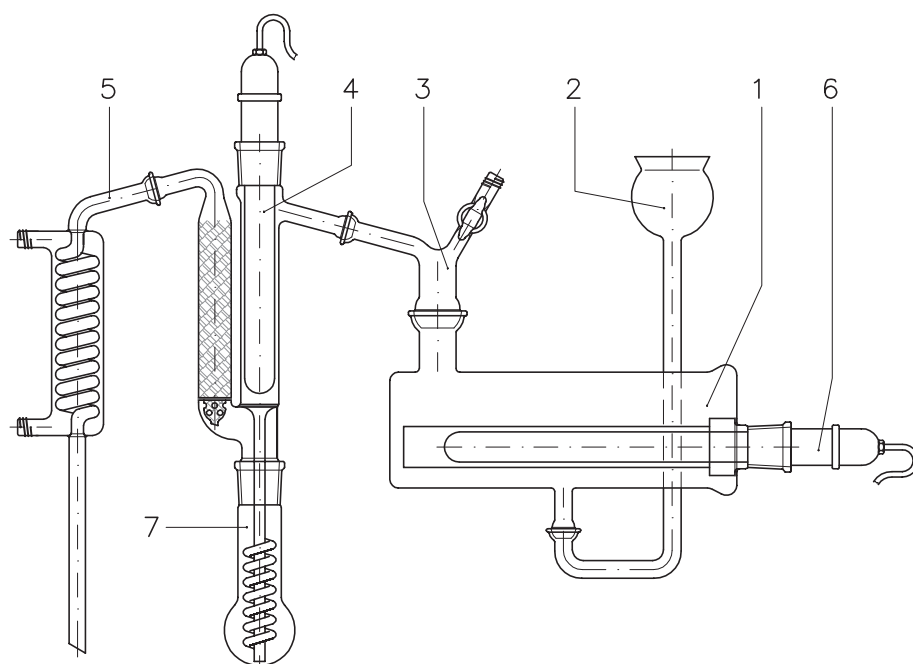
After filling of the sample flask with the fine ground sample it is poured over with a mixture from silicic acid and phosphoric acid (but not too much to avoid a bubble over). The lying evaporator with horizontal heating rod and filled with water ensures a continuous boiling and a calm continuous vapour flow, which is heated in the vapour super heater at 250 °C. The liquid volume keeps at the same level in the sample flask at this high temperature and so the flask need not to be heated. During the distillation, the horizontal heating rod must be covered with enough water, which can be dropped in. The vapour temperature and so the distillation speed keeps utmost constant. The arisen  $\text{SiF}_4$  (silicon fluoride) escapes via the coil condenser and can be titrated with Thiocyanat according to Volhard.

 This apparatus is delivered with frame and supports.

**Catalogue No. SAA 09299**

Delivery

Part No.	Qty.	Description
1	1	Evaporator, model "Normag", with socket NS 29/32, KS 35 and KS 18
2	1	Addition funnel with KS 18
3	1	Connecting piece with KS 35, KS 18 and vapour outlet standard stopcock 3 NS
4	1	Vapour super-heater with socket/cone NS 29/32 and 2 KS 18, complete with Raschig-rings
5	1	Coil condenser with KS 18
6	2	Quartz heating rod, coupled, complete with duplex switch for 220 Volt AC
7	1	Sample flask with NS 29/32, complete with glass spiral
	3	Spherical joint clamp for KS 18
	1	Spherical joint clamp for KS 35



## GAS PURIFICATION APPARATUS (COMPLETE)

This gas purification unit for nitrogen and rare gas is completely equipped with manifold distributor.

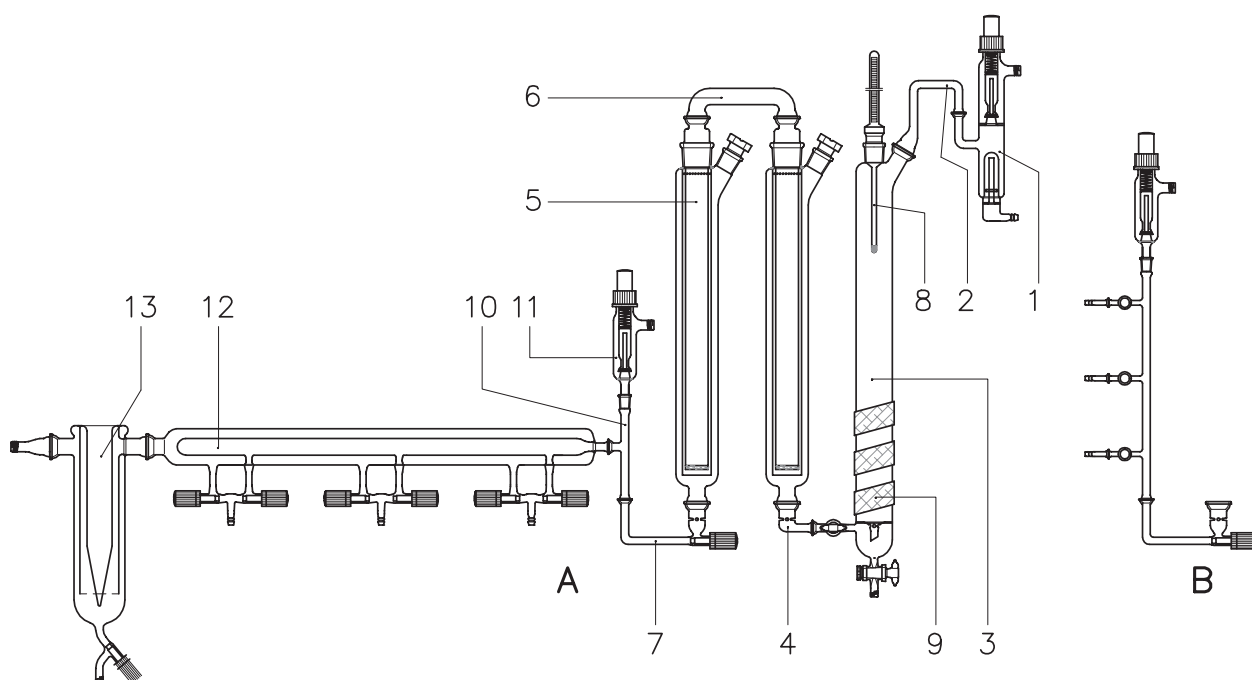
Chemical reactions with light and moisture sensitive substances e.g. free radicals and numerous organo-metallic compounds are proceeded with inert gas. Gases obtained commercially, e.g. nitrogen or preferably argon are sufficient pure for many purposes and can directly be used from the bottle. But for experiments with hyper-sensitive substances, even purified nitrogen needs a further purification to eliminate the in very low concentration existing contamination of oxygen, moisture, carbon dioxide and others. Important is, that the subsequent cleaning is proceeded just before the operation run to keep the risk of contamination or non-tightness through the long tube and hose lines as low as possible. The Normag gas purification apparatus has proved very worthwhile for fine purification of nitrogen and rare gas. Delivered with a moveable table rack frame.

## Design A, with horizontal manifold distributor

Catalogue No. SAA 05101

Delivery

Part No.	Qty.	Description
1	1	Absorption tube incl. pressure valve
2	1	Adapter, bent, with KS 18 and KS 35
3	1	Absorption tube with KS 35, NS 29/32, 2 single way stopcocks 4 NS and KS 18
4	1	Adapter, bent, with KS 18 and KS 35, with piercing
5	2	Absorption tube with NS 45/40, NS 29/32 and KS 35, complete with standard ground joint connection NS 29/32 and inset tube with NS 45/40, KS 35 and frit D 00
6	1	Adapter, bent with 2 KS 35
7	1	Adapter with KS 35, spindle valve SPV 6, KS 18 and piercing
8	1	Contact thermometer with NS 29/32, 0-250 °C, installation length 220 mm
9	1	Hot band, resistant up to 260 °C
10	1	Adapter with 2 x KS 18 and NS 14/23
11	1	Pressure valve with NS 14/23
12	1	Manifold distributor with 6 spindle valves SPV 6 and 3 olives D 11
13	1	Cold trap with 2 x KS 35
	2	Spherical ground joint clamp KS 18
	5	Spherical ground joint clamp KS 35



## Design B, with vertical manifold distributor

Catalogue No. SAA 05102

As design A, but:  
 without cold trap, part No. 13,  
 without adapter, part No. 10  
 with non-jacketed manifold distributor

## CYCLISATION APPARATUS (COMPLETE)

according to Prof. Dr. Schill and Dr. Neubauer

Apparatus for simple dilution and continuous feed of test solutions, suitable for carrying out of one component dilution principle reactions.

### Principle:

A substance dropping out of a funnel becomes strongly diluted through reflux condensate before the substance drains with a continuous flow into the reaction vessel.

### Application and features:

In chemical reactions the yield often depends on the concentration of the component to be fed. Useable results are only reached under high dilutions, especially in cyclisation. It is necessary to avoid single droplets and to ensure a continuous feeding of the reaction solvent.

### Local over-heating are avoided.

A single neck flask is sufficient as reaction flask since all other functions -dropping in, dilution, continuous feeding, stirring, cooling, pressure equalising, are taken over from the cyclisation inset.

Due to the permanent liquid circulation, solvent is saved. The test solution can be dropped in as concentrated solvent. The volume of the solvent in the reaction flask will not be increased and so the flask need not to be chosen bigger.

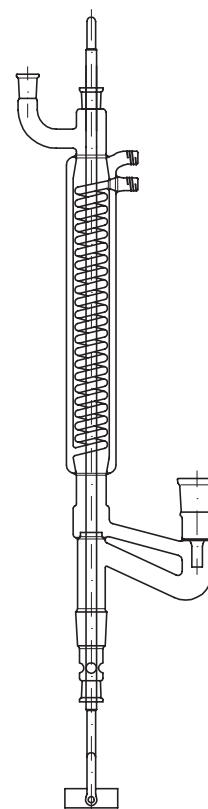
Higher results can be reached by avoiding of local larger gradients of concentration.

The standard dimensions, guaranteed by series production, ensure reproducible and comparable results.

Hardly soluble substances which can only dropped in under heating, are solved in the hot reflux solvent concentrate.

### Comment:

Since the dropping in of a component in cyclisation often lasts over a longer period of time, a great importance has been attached to the safe operating of the stirrer. As one can see in the picture, the stirrer shaft is guided through the cyclisation knee and the jacketed reflux condenser. As guiding for the stirrer shaft serve two PTFE sockets. The lower guide if the shaft is continuously lubricated and cooled by the reflux condensate. The rising vapours flows through four openings into the cyclisation knee and through the edge into the jacketed reflux condenser. The condensate runs over the walls, is sampled in the edge and is guided to the side arm of the knee which is made as a siphon. The substance fed over a addition funnel flows through a narrowing to the liquid which is dammed in the knee, is solved there and strongly diluted by the reflux condensate. The reaction media comes through the four openings into the flask directly in the suction of the stirrer, the place of the most intensive distribution. A liquid holdup cannot occur during normal operation. The total cross-section of the four openings (400 mm<sup>2</sup>) is chosen larger as the cross-section of the a conical ground joint NS 29/32 (350 mm<sup>2</sup>). The thread connections of the jacketed reflux condenser for inlet and outlet of the cooling water are located at the back of the cyclisation apparatus. The side arm with NS 14/23 is located in front. It can serve for accommodation of a drying tube. The pressure equalising is also proceeded via this side arm.



## Cyclisation apparatus

with conical ground joint cone NS 29/32, conical ground joint socket NS 29/32 and conical ground joint socket NS 14/23, complete with stirrer shaft and two hose connections GL 14 (material Hostafon®-ET, glass fibre reinforced)

**Catalogue No. SAA 09005**

All ground joints are also available in other standard sizes, e.g. US-standard.