Syncore®

Polyvap/Analyst/Reactor

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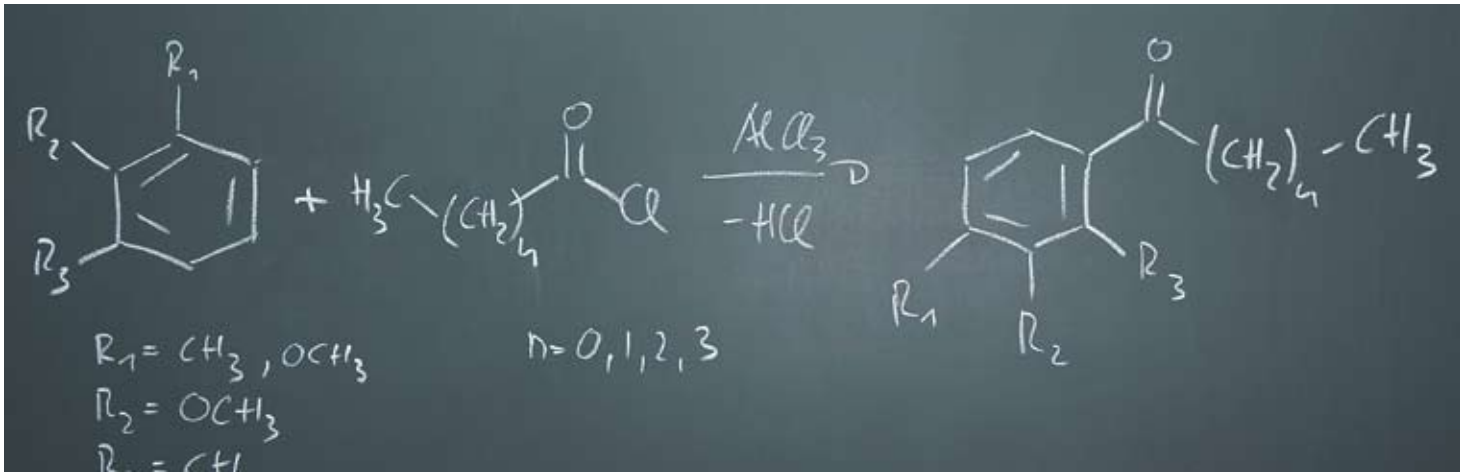
Syncore® –
An efficient, safe and environmentally sound tool for parallel sample processing



Syncore® comprises three instruments suitable for all aspects of multiple sample processing. Its design concept allows one unit to perform as a parallel evaporator (Polyvap) which can be instantly converted into a parallel concentrator (Analyst) or a parallel reaction station (Reactor). Thus, the field of applications includes fast parallel evaporation of multiple samples, the smooth concentration to pre-defined residual volumes and parallel synthesis.

The modular concept

Overview **page 4, 5**

Evaporation to dryness: Polyvap

The Polyvap is a unique parallel evaporator which allows

- fast
- safe
- environmentally sound
- automatic

evaporation of samples ranging in volume from 0.5 to 500 ml.

Polyvap **page 6, 7**

Concentration to residual volumes: Analyst

Chemical analysis often requires concentration of big volumes to small residual volumes. The Analyst performs this task with a locally cooled appendix. It further provides high recovery rates due to smooth sample processing.

Analyst **page 8, 9**

Parallel synthesis: Reactor

The Reactor is designed to give high efficiency and maximum flexibility for parallel and combinatorial synthesis. Great time savings are achieved using optional accessories which optimize the workflow between synthesis and work-up stage.

Reactor **page 10, 11**

Accessories **page 13**

Büchi Syncore® Line – The modular system for evaporat

Parallel evaporation: Syncore® Polyvap

Parallel evaporation of 4, 6, 12, 24, 48 and 96 samples ranging in volume from 500 to 0.5 ml.

Each rack has its own PFA-coated aluminium lid with individual vacuum connections.

The Platform

The Platform is the core component of the three Syncore configurations. It provides basic functions like shaking, heating (150 °C) and cooling (–20 °C) with an optional cooling plate.

Parallel concentration: Syncore® Analyst

Concentrate solutions in parallel to a cooled residual volume in formats of 4, 6 and 12.

The Flushback Module – available in 6 and 12 formats – significantly increases recovery rates.

Common accessories

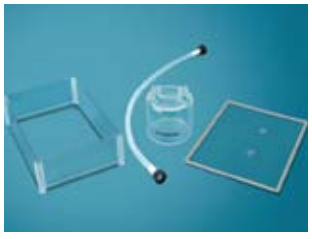
Recirculating Chiller

Cooling of the Condenser, Cooling Plate, Receiving Flask, Reflux or Flushback Module is best done with the B-740/14 or MultiStat 40.

Deep-Temperature Insulation

Low-Temperature Insulation prevents icing of the reaction platform.

High-Temperature Insulation



Increase the efficiency of the evaporation process with an appropriate High-Temperature Insulation Kit.

Solvent recovery

Condense solvents with either a tap water or dry-ice condenser.

ion, sample preparation and synthesis

A horizontal orbital movement with a maximum rotational speed of 600 rpm produces a strong vortex in the sample tube thereby preventing bumping during operation. Temperature profiles can either be preprogrammed in timed stages or can be manually controlled.

Parallel Synthesis: Syncore® Reactor

The Reflux Module – available in formats of 24, 48 and 96 – affords efficient refluxing.

The Inert Gas Module enables operation under inert conditions, manual solvent addition and sampling for the 24 and 48 rack formats.
In conjunction with the Vacuum Cover, the reaction mixture is readily concentrated to dryness after synthesis.

Perform filtration, washing, parallel solvent dispensing, and liquid-liquid extraction under inert conditions with the Filtration Unit (format 24).

Great time saving

A refrigerated receiver reduces the evaporation time by up to 30%. Ideal for evaporation of solvent mixtures without cumbersome breaks.

Applications

The scope of application in parallel syntheses and sample preparation is shown in several application notes.

Vacuum Controller

The programmable Vacuum Controller V-855 can easily cope with complex solvent mixtures and allows automatic distillation.

Vacuum Pump

The Vacuum Pump V-700/ V-710 is optimally designed for use with V-855 and Syncore.

Evaporation to dryness: Polyvap – Efficient parallel evaporation of a wide sample range

Parallel evaporation of multiple samples is an essential prerequisite to increase productivity in parallel and multistage synthesis, extraction, quality control and chromatography. The Polyvap solves this problem quickly and safely even with high-boiling solvents. Interchangeable racks make it possible to evaporate samples ranging in volume from 0.5 to 500 ml. Optimal evaporation conditions are automatically adjusted using the optional Vacuum Controller V-855.

Syncore® Polyvap advantages

- No cross-contamination
- High chemical resistance
- Environmentally sound operation (ISO 14000)
- Automatic distillation with Vacuum Controller V-855
- Evaporation of high-boiling solvents like DMSO and DMF
- Fully transparent racks in format 4 and 6
- Compatibility with the Syncore Reactor and Syncore Analyst

Areas of application

- Evaporation of chromatography samples
- Evaporation after parallel extractions
- Gravimetric analyses in quality control
- Evaporation after parallel reactions

Automatic distillation

With the help of the vacuum gradient function of the Vacuum Controller V-855 smooth adjustment to the end-vacuum is possible. This function is also ideal for evaporating off solvent mixtures which typically accumulate after chromatography. The settings can be saved in user-defined pressure profiles.

	Order no.
Vacuum Controller V-855	47232

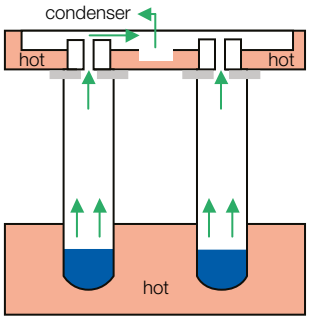
Polyvap features

Maximum flexibility

Exchangeable racks provide maximum flexibility in both sample volume and sample numbers. The racks are available in formats of 4, 6, 12, 24, 48, and 96 samples ranging in volume from 500 ml to 0.5 ml depending on the rack format.

No cross-contamination

Each sample has its own vacuum connection via a vacuum cover. This design principle, together with the use of inert materials such as glass, PFA-coated aluminium and PTFE, prevents cross-contamination. The cover is heatable to 70 °C to prevent condensation.



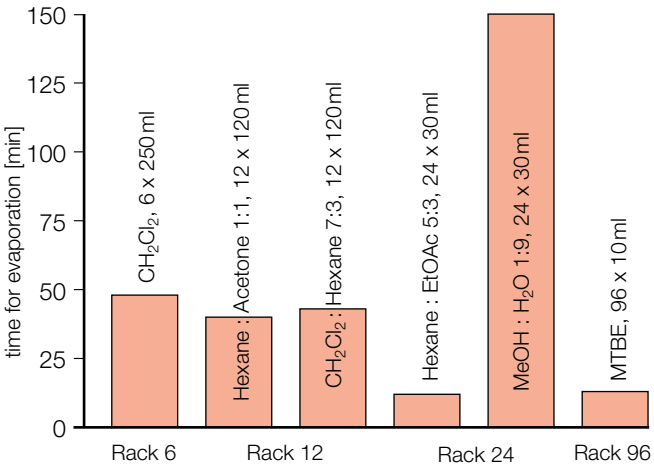
Schematic representation of a rack with two tubes individually connected to the heated vacuum cover. The vapor is conducted to the condenser via grooved channels.

High-boiling solvents

High-boiling solvents, such as DMSO or DMF, are efficiently evaporated using the High-Temperature Insulation Kit. The kit comprises a rack and cover insulation with Woulff bottle and hose.

Performance data

Evaporation rates



Conditions: Parallel evaporation using temperature settings of 42 °C (rack) and 50 °C (vacuum cover). Optimized vacuum gradient for each solvent controlled by the Vacuum Controller V-855. The condenser is cooled with the Chiller B-740/14.

Typical applications

Extraction samples

High-pressure solvent extractions (PSE or ASE**) provide a considerable number of samples within a short period of time. With the PSE, ASE Rack up to 24 samples are evaporated simultaneously sustaining a high sample throughput in routine analysis.

Chromatography samples

In chromatography a large number of samples are pooled in bigger flasks or evaporated individually. The workflow in sample work-up is significantly increased by simultaneous evaporation of multiple samples.

Order information for Polyvap specific accessories

Positions	Working volume [ml]	Number of vessels incl.	Order-no. Rack	Order-no. Vacuum Cover	Order-no. High-Temp. Kit
4	50–500	4	47790	38245	
6	25–250	6	47770	38246	
12	5–120	12	40900	40910	
24	2–30	50 test tubes for PSE, ASE** tubes* for Falcon tubes*	38188 42660 38440	40920	41922
48	1–20	100 test tubes	42855	42850	
96	0.5–10	100 test tubes	38277	40930	41923

* Tubes are not included in the rack.

** ASE is a registered trademark of Dionex Corporation.

Concentration to residual volumes: Analyst – Smooth concentration with high recovery rates

Efficient parallel concentration of large sample volumes to pre-defined residual volumes is a cornerstone of virtually every sample preparation technique in environmental analysis and quality control. In addition, smooth evaporation of thermosensitive compounds is crucial in preventing thermal decomposition. The Analyst copes with both tasks by cooling a small appendix at the bottom of the sample vessels. Sample adhesion to the glass wall is prevented by creating a gentle flushing action at the top of the glass wall with partially condensed vapor.

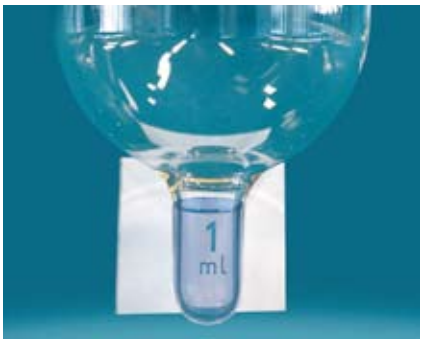
Syncore® Analyst advantages

- Smooth concentration to small residual volumes
- No thermal decomposition
- High recovery rates
- No cross-contamination
- Automatic distillation with Vacuum Controller V-855
- Complete solvent recovery

Areas of application

- Soil analysis
- Food-processing analysis
- Quality control
- Natural product extraction

Smooth concentration to residual volumes

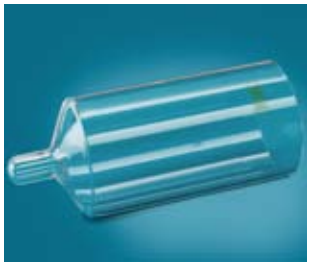


The Analyst sample vessels feature a small appendix at the bottom which is locally cooled by water or a suitable coolant. This stops the evaporation process as the solvent level reaches the top of the cooling zone. Hence, the sample is concentrated in a small, cooled residual volume, thereby preventing thermal decomposition (see scheme on page 9).

Except for the water-cooled appendix, the geometry of the Analyst racks are identical with the Polyvap racks. This allows synergetic usage of the corresponding vacuum covers (see p. 7).

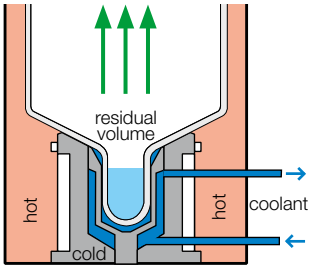
Analyst features

Tubes with appendix



The Analyst sample vessels feature an appendix with three different volumes all compatible with the same rack. There are two versions available: with and without graduated level indication.

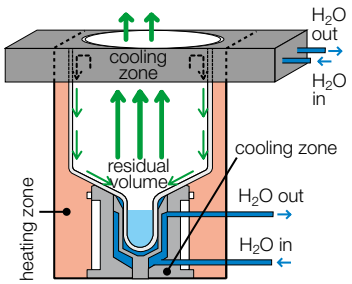
Local cooling zones



Schematic depiction of the locally cooled appendix of the sample vessel. The solvent evaporates above this cooling zone. The lower temperature in the appendix prevents evaporation under constant vacuum conditions.

The Flushback Module

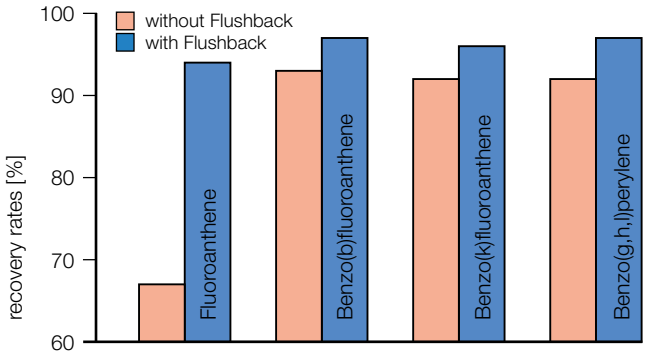
The Flushback Module is an optional accessory which is placed on top of the rack in formats of 6 or 12.



Apart from the cooling zone at the appendix there is an optional Flushback Module available which partially condenses the vapor at the top of the vessels. Thus, the glass wall is continously rinsed resulting in higher recovery rates.

Performance data

Recovery rates for concentration of polycyclic aromatic compounds (PAH) with the Analyst R-6 (3 ml residual volume) without (left) and with (right) Flushback Module in cyclohexane.



Conditions: Parallel evaporation using temperature settings of 40 °C (rack), 50 °C (vacuum cover), 5 °C (Flushback Module), 7 °C (residual volume). Vacuum gradient from 900 –150 mbar in 30 min. controlled by the Vacuum Controller V-855. Total time for evaporation process: 60 min.

Typical applications

Right: with Flushback
Left: without Flushback

The Analyst is designed for applications in which a concentration step is required. This is typically the case in food&feed and environmental analysis, or quality control. Since the sample rests in the cooled appendix the Analyst is also ideal for evaporation of temperature-sensitive compounds.
In analysis high recovery rates are essential. For such applications the Flushback Module is strongly recommended.

Order information for Analyst specific accessories

Positions	Working volume [ml]	Residual volume* [ml]	Tubes** no graduation	Tubes** graduated	Order-no. Rack	Order-no. Vacuum Cover	Flushback Module
4	50–500	3.0	47797	47740	47794	38245	not available
		1.0	47798	47741			
		0.3	47799	47742			
6	25–250	3.0	38555	38557	47777	38246	48654
		1.0	38569	38575			
		0.3	38485	38168			
12	5–120	3.0	46014	46070	46000	40910	46036
		1.0	46015	46071			
		0.3	46016	46072			

* Other volumes on request

** Tubes are not included in the rack.

Parallel Synthesis: Reactor – Improve your work–flow in synthesis and work–up

Modern parallel synthesis demands a great deal of versatility, efficiency and convenience. This includes features like cooling, refluxing, inert conditions, solvent dispensing, solid–phase chemistry, filtration, liquid–liquid extraction, and evaporation. While performing the reaction and the work–up stage without sample handling, this greatly improves the workflow efficiency.

Syncore® Reactor advantages

- Highly versatile and modular
- Comprises all relevant synthesis and work-up procedures
- Reaction and subsequent work-up stage in the same vessels without sample handling
- Copes with solid-phase chemistry including washing, filtration and extraction steps
- Programmable temperature profiles
- Reproducible conditions

Areas of application

- Combinatorial chemistry
- Solid-phase peptide chemistry
- Heterogenous and homogenous catalysis
- Process optimization
- Evaluation of new synthesis methods

Application notes

The Syncore Reactor has been used for parallel esterification of carboxylic acids, Friedel-Crafts acylation, electrophilic nitration, reductive amination and more. For further information see:

www.buchi.com
> parallel reactors
> applications

Filtration, liquid dispensing and extraction

The Filtration Module is used in conjunction with the rack format 24. The unit not only permits simultaneous filtration of 24 solution- or solid-phase reactions, but also allows simultaneous solvent addition under inert conditions from a standard laboratory dispenser. Washing, filtration, parallel solvent dispensing and liquid-liquid extraction are easily performed.
The filtrate is N_2-pressure driven to a receiving vessel, waste or collected to 24 vessels with the Collecting Unit. Both the Filtration and Collecting Unit are manufactured from inert materials and are compatible with virtually all common reagents.

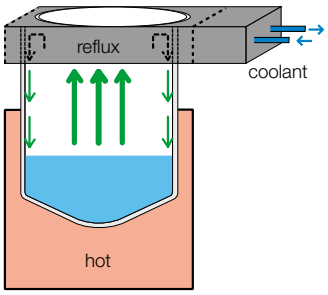
Filtration Unit accessories for format 24

	Order no.
Filtration Unit	42900
Collection Unit	42940

Reactor features

Refluxing

Refluxing is easily carried out by placing the Reflux Module on top of the rack 24, 48 or 96. The module is connected to tap water or a recirculating chiller and cools the top part of every reaction tube.



Schematic representation of a test tube heated by the rack and cooled by the Reflux Module. Using a recirculating chiller with a suitable coolant, methanol was heated under reflux at 90 °C for two hours with a loss of 0.5 %.

Inert conditions

The Inert Gas Module accomodates gas in- and outlets for nitrogen or argon connection for air- or moisture-sensitive reactions. In addition, exchangeable septa allow maximal freedom in manual solvent addition or sampling for GC/MS or HPLC analyses under inert conditions.

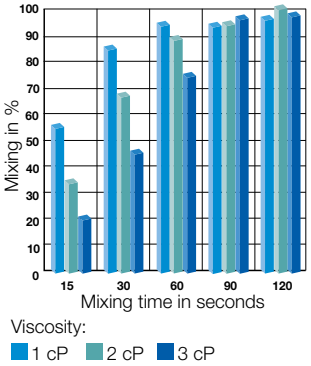
Low-temperature reactions

The Cooling Plate in conjunction with a suitable chiller (B-740/14) can cool the platform to –20 °C. An Insulation Rack helps prevent icing (format 24, 48 and 96).

	Order no.
Cooling Plate	38481
Rack Insulation	38144
Plate Insulation	41869

Performance data

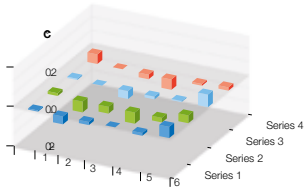
Efficient mixing



Conditions: Rack 24, round glass tube, filled to depth of 6 cm, eccentricity 4 mm, rotation 460 rpm, viscosity 1, 2 and 4 cP, solids = 2 g silica gel 0.040–0.063 mm

The adjustable eccentricity control for the vortex movement ensures complete mixing of the samples for solid and liquid phase chemistry.

Reproducible conditions



	1	2	3	4	5	6
Series1	0.1	-0.5	-0.2	0.0	-0.2	0.9
Series2	0.2	-0.7	-0.4	-0.8	-0.3	0.5
Series3	0.1	0.0	-0.4	-0.2	0.1	0.9
Series4	0.7	-0.0	-0.3	-0.8	0.2	0.4

Deviation from mean value in °C. Conditions: Rack 24 with test tubes, 24 x 25 ml water, temperatures measured at the equilibrium state against the intial setting of 80 °C for the experiment.

The temperature is uniform across all positions of the rack. This ensures reproducible reaction conditions with minimal deviation.

Order information for Reactor specific accessories

- Inert Gas Cover: Vacuum Cover with Inert Gas Module already assembled to one unit
- Inert Gas Module: Plate can be mounted to the Vacuum Cover instead of the glass plate

Positions	Working volume [ml]	Reaction vessels	Order-no. Rack	Order-no. Reflux Module	Order-no. Inert Gas Cover	Order-no. Vacuum Cover	Order-no. Inert Gas Module
24	2–30	50 test tubes	38188	41901	40936	40920	41909
		50 capped tubes	38188	41901			
		Falcon tubes*	38440	**			
48	1–20	100 test tubes	42855	42847	42860	42850	42859
96	0.5–10	100 test tubes	38277	46095	**	40930	**

* Tubes are not included ** On request

Order information for complete Syncore® instruments

Polyvap order matrix

1P□□□□000

Rack type (incl. vacuum cover)
1 Crystal Rack R-4
2 Crystal Rack R-6
3 Rack R-12
4 Standard Rack R-24
5 Falcon Rack R-24
6 Rack R-96
7 Rack R-24 PSE, ASE
8 Rack R-48

Voltage
1 100 V 50/60 Hz
2 120 V 50/60 Hz
3 230 V 50/60 Hz

Condenser
0 None
S Type S, Standard for chiller or tap water, P+G coated
C Type C, Cold trap for dry-ice cooling, P+G coated

Round receiving flask, KS 24/20, P+G coated
0 None
1 1 l volume (suggested formats: 24, 96)
2 2 l volume (suggested formats: 4, 6, 12)

Analyst order matrix

1A□□□□□□0

Graduated level indication of appendix
Y Yes
N No

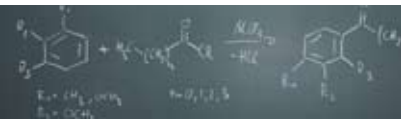
Residual volume
1 1.0 ml
2 0.3 ml
3 3.0 ml

Voltage
1 100 V 50/60 Hz
2 120 V 50/60 Hz
3 230 V 50/60 Hz

Condenser
0 None
S Type S, Standard for chiller or tap water, P+G coated
C Type C, Cold trap for dry-ice cooling, P+G coated

Round receiving flask, KS 24/20, P+G coated
0 None
2 2 l volume

Rack type (incl. Vacuum Cover)
1 Crystal Rack R-4 Analyst
2 Crystal Rack R-6 Analyst
3 Rack R-12 Analyst



Reactor order matrix

1R□□□□00□

Rack type (incl. Reflux, Module, Inert Gas Cover)
0 None
4 Standard Rack R-24
5 Falcon Rack R-24
6 Standard Rack R-96 (no Inert Gas Cover)
8 Standard Rack R-48

Voltage
1 100 V 50/60 Hz
2 120 V 50/60 Hz
3 230 V 50/60 Hz

Condenser
0 None
S Type S, Standard for chiller or tap water, P+G coated
C Type C, Cold trap for dry-ice cooling, P+G coated

Round receiving flask, KS 24/20, P+G coated
0 None
1 1 l volume
2 2 l volume

Filtration unit R-24 (instead of Inert Gas Cover)
Y Yes
N No

Order information for general Syncore® accessories

Platform

Basic platform for individual combination to meet personal demands.

	Order no.
230 V	38429
120 V	38430
100 V	38431

Sample vessel carrier

Carrier for Analyst or Polyvap vessels in formats of 4, 6 and 12.

	Order no.
Format R-12	40077
Format R-6	40076
Format R-4	40075

Vessel lid

Lid for R-12 and R-6 Analyst and Polyvap tubes. The set comprises 12 or 6 pieces, respectively.

	Order no.
Set format 12	48690
Set format 6	48689

Condensers

Standard condenser (type S) for tap water with rod, clamps, 1 or 2 liter flask.

	Order no.
Type S, 1 l flask	37690
Type S, 2 l flask	40146

Dry-ice condenser (type C) with rod, clamps, 1 or 2 liter flask.

	Order no.
Type C, 1 l flask	38371
Type C, 2 l flask	40147

Refrigerated receiver

Receiver with integrated cooling loop used in conjunction with a type S condenser.

	Order no.
Refr. receiver	48640

4 Positions

Crystal Rack R-4 for working volumes of 50–500 ml, incl. 4 tubes.

Order no. 47790

6 Positions

Crystal Rack R-6 for working volumes of 25–250 ml, incl. 6 tubes.

Order no. 47770

12 Positions

Rack R-12 for working volumes of 5–120 ml, incl. 12 tubes.

Order no. 40900

24 Positions

Rack R-24 for working volumes of 2–30 ml.

	Order no.
with 50 tubes	38188
for PSE tubes	42660
for Falcon tubes	38440

48 Positions

Rack R-48 for working volumes of 1–20 ml, incl. 100 test tubes.

Order no. 42855

96 Positions

Rack R-96 for working volumes of 0.5–10 ml, incl. 100 test tubes.

Order no. 38277

Vacuum Cover for all rack formats R-4.

Order no. 38245

Vacuum Cover for all rack formats R-6.

Order no. 38246

Vacuum Cover for all rack formats R-12.

Order no. 40910

Vacuum Cover for all rack formats R-24.

Order no. 40920

Vacuum Cover for rack format R-48.

Order no. 42850

Vacuum Cover for rack format R-96.

Order no. 40930

Optimal operation with other Büchi products

Vacuum Controller

V-850: Simple Vacuum Controller for manual operation.
V-855: Programmable Vacuum Controller with gradient function and automatic distillation (stage probe).

	Order no.
V-850	47231
V-855	47232
Probe for AutoDest	47235

Vacuum Pump V-700

Chemical resistant PTFE diaphragm pump with a final vacuum of <10 mbar. Recommended configuration with sec. condenser, Woulff bottle and Vacuum Controller V-855.

	Order no.
V-700	71000
V-700, V-855, condenser	71311
V-700, V-855, cold trap	71312

Vacuum Pump V-710

Four head diaphragm pump with a final vacuum of 2 mbar. Recommended configuration with secondary condenser, Woulff bottle and Vacuum Controller.

	Order no.
V-710	72000
V-710, V-855, condenser	72311
V-710, V-855, cold trap	72312

Recirculating Chiller

Recirculating chillers for operation with type S condenser, Analyst Rack, Refrigerated Receiver, Reflux- and Flush-back Module.

	Order no.
B-740, 800 W	37740
B-740, 1400 W	37741
MultiStat 40	41830

Applications for Syncore®

The scope of applications in parallel synthesis and sample preparation is shown in many application notes. For further information see:

www.buchi.com
> Parallel reactors
> Applications

A comprehensive list of optimized evaporation settings for Syncore is online available at:

www.buchi.com
> Applications
> Evaporation

The Syncore® improves the work-flow in multiple sample processing, such as evaporation of chromatography or extractions samples (Büchi B-811, PSE, ASE, soxhlet), sample concentration for GC/MS, HPLC analyses, or parallel synthesis.

Technical Data Syncore® Platform

Dimensions (L x D x H)	480 x 487 x 354 mm
Weight	30 kg
Power rating	1500 W
Temperature range heating plate	up to 150 °C
Rotation speed	0 to 600 rpm
Eccentricity	0 to 10 mm
Programmable temperature programs	9 steps up to 9 h:59 min –20 °C to +150 °C
24 V DC Vacuum Cover	120 W, max. 70 °C

Connection
TTL for external on/off signal
24 V DC temperature-controlled valve
24 V DC cooling water valve (0.5 °C hysteresis)

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