SpeedDry

Rotational Vacuum Concentrators

Routine Processes


The Flexible Line of Products
for Optimal Concentration
CHRIST

Rotational Vacuum Concentrators: Evaporation of Temperature Sensitive Samples with Care

The Process

This process is used for the evaporation, drying, purification and concentration of samples. This method is an alternative to the following processes:

- Distillation systems and rotational evaporators use high temperatures and are working next to normal pressure.

- Freeze-drying systems operate at very low temperatures and high vacuum levels. Although sublimation (the direct transformation from frozen solid to steam) protects the sample, it is time consuming.

Rotation vacuum concentrators provide a method between the two above processes. The sample solvent evaporates at room temperature, at low pressure and without having to be frozen. This occurs relatively quickly. There is no thermal strain on the sample which is important when working with thermally sensitive biological or clinical substances. The material is rotated at a moderate centrifugal speed of 1.350 to 1.550 min^{-1}. The resulting gravitational force prevents the product from spitting and bumping. The solvent is collected in traps and can be reused or discarded.

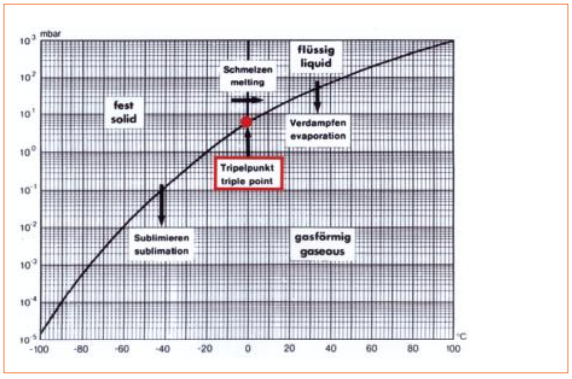
The economically efficient Rotational Vacuum Concentrator

- no sample foaming, minimal sample loss
- simultaneous, multiple sample drying
- concentration of sample on tube bottom (other than in vortex-shaker), an advantage when using small volumes of thin solutions
- suitable for drying of water and solvent-containing substances for volumes of less than 1 ml up to 3 liters
- reproducible drying processes through control of process parameters such as rotor chamber temperature (energy input for evaporation) and vacuum (including the automatic setting of optimal pressure, depending on pump system)
- safe and simple solvent recovery

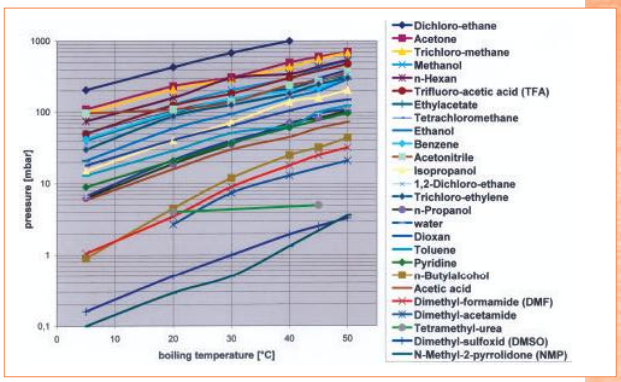
Possible uses

- DNA/RNA (solvents mainly water, ethanol, methanol)
- oligo-synthesis, peptides
- PCR (polymer chain reaction)
- HPLC (solvent mainly water/acetonitril)
- isolation/synthesis of organic substances
- storing and handling of substances (substance libraries)
- combinational chemistry
- high-throughput-screening (HTS)
- analysis of food and environmental samples
- general laboratory evaporation

vapor-pressure curve for H_2O



vapor-pressure curves for commonly used organic solvents



SpeedDry Vacuum Concentrators: Performance that Speaks for itself

- **Magnetic drive with speed control:** centrifugal force eliminates bumping and foaming, no rotating parts outside of the rotor-chamber, the chemicals remain within sample chamber.
- **Simple interface with the push of a button:** Concentrator Display (CD) interface, automatic sequence for start and stop, vacuum on and off depending on rotor speed, automatic aeration, sample is prevented from spitting.
- **Fast evaporation:** high input of energy through electrical heating of rotor chamber, can be set in 1°C intervals from 30°C to 60°C (80°C optional with the RVC 2-33), cooling traps reduce evaporation time for larger sample volumes.
- **Useful for water or solvent containing samples:** Basic Speed Dry systems with durable glass cover (is optional with the RVC 2-25), stainless steel rotor chamber, chemicaly resistant seals, anodized rotors. RVC 2-18 CD also available in HCL-resistant version.

Concentrator Display (CD) Interface

- microprocessor system with LCD display
- speed control
- rotor chamber heating can be set in 1°C intervals from 30°C to 60°C (80°C)
- pre-set time from 5 minutes to 12 hours
- LC display shows important process and system parameters:
  - rotor temperature
  - time
  - open/close of cover
  - rotor speed
  - state of vacuum ("evacuated / aerated")
  - visual alarm with error code
  - optional data-interface

- **No limits to your applications:** system components can be individually combined, cooling traps range from 2-4 liters and temperatures of -50/-60/-90 and -105°C, chemical resistant diaphragm vacuum pumps from 10 mbar to 2 mbar final vacuum or chemical hybrid pumps with < 0.1 mbar final vacuum (also for solvents with high boiling points).

- **Combination possibilities with your freeze-drying system:** easy connection via rubber valve, especially suited for substances with high boiling points (e.g. DMSO, NMP)

- **Broadest range of rotors:** from standard tubes to special flasks - our own rotor manufacturing covers almost every need.

- **Made in Germany:** ISO 9001- certified series production, qualified technical and application service.

SpeedDry Product Range for Vacuum Concentrators
Basic Appliances in Three Different Sizes

RVC 2-18 CD

- the **mini** concentrator: inexpensive and compact table-top concentrator suited for smaller sample volumes
- special DNA and HCL systems available
- chemical resistant diaphragm pumps (2m³/h suction capacity, 9 mbar final vacuum), standard, vacuum system with lower vacuum and vacuum controls, optional
- normally used without cooling traps

RVC 2-25 CD

- the **mid-size** concentrator: all-purpose table-top concentrator for the routine concentration of larger sample volumes
- rotor capacity 108 x 1.5/2.2 ml tubes up to 2 x microtiter plates
- standard acrylic glass cover, optional stainless steel/glass compound cover with window (corrosion proof, e.g. for DCM/ACN)
- chemical resistant diaphragm pumps (2m³/h suction, 9 mbar final vacuum), standard, vacuum system with lower vacuum and vacuum controls, optional
- optional combination with cooling traps (2 or 4 Liters) for increased evaporation

RVC 2-33 CD

- The **maxi** concentrator: a multipurpose system for large sample volumes with practically all types of solvents
- rotor capacity 216 x 1.5/2.2 ml tubes up to 12 x microtiter plates or 4 x deep-well plates
- stainless steel/glass compound cover with window (corrosion proof)
- high-performance drive system, 1.550 min-1 (500xg f. micro tubes) prevents bumping and foaming (e.g. with DCM)
- practically tolerant to imbalance (> 50 g)
- c hemical resistant diaphragm pumps (2m³/h suction, 9 mbar final vacuum), standard, vacuum system with lower vacuum and vacuum controls, optional, chemical hybrid-pump for solvents with high boiling points (e.g. DMSO)
- recommended use with 4 liter cooling traps due to high volume evaporation (-50°C, -60°C, -90°C or -105°C)
- optional strobe light for monitoring of the evaporation process
- flexible use as vacuum drying chamber through easy dismantling of rotor shaft

More Choice for the Job at Hand-
the RVC-Module System Adapts to Your Needs

System solutions for special processes

The complete RVC 2-18 DNA system is designed for the concentration of DNA / RNA in ethanol/methanol / water solutions in up to 72 samples of 1.5 ml / 2.2 ml tubes. A special RVC 2-18 HCl version exists for material containing in hydrocloric acid. For other applications the systems can be configured according to need – please contact our application specialists for assistance.

Rotors for virtually all sample-tubes

We profit from the vast know-how of our sister company Sigma Laboratory Centrifuges which produces all of the rotors for our vacuum concentrators. Our development engineers and specialists are experienced in the production of standard and custom-made rotors. They are manufactured using state-of-the-art CNC machines, are precisely balanced and laser marked and coded. Our aim is to produce rotors with flawless performance quality and high chemical resistance for a long period of use.

Rotor-Table RVC

Nominal tube volume (ml)	Tube size diameter x length (mm)	RVC 2-18 CD	RVC 2-25 CD	RVC 2-33 CD
0.2	6 x 20		3 x 72	4 x 96
0.25 / 0.5	5.8 x 47	2 x 40		
0.6	6 x 38			
0.5 / 0.75	7.9 x 28	3 x 30		
1	5 x 100	18	48	
1	7.2 x 40	3 x 36		4 x 72
1.5 / 2.2	10.8 x 38	3 x 24	3 x 36	3 x 72
2	2 x 36		3 x 36	
2.5	11.7 x 32	3 x 24		
2.5	12 x 36	3 x 24	2 x 36	3 x 48
4	12.7 x 46		2 x 36	
5	15 x 45	3 x 18	2 x 30	3 x 48
5	15.6 x 57	2 x 18		
5	16.5 x 35		3 x 24	
4 / 7	12.5 x 75–85		48	72
4 / 7	12.5 x 70–100	18		
8 /10	12–13 x 100–120		36	54
10	20 x 62	12		
13	15.2 x 100		36	48
10 / 15	16.5 x 80–100	12	24	48
15 / 18	16.5 x 100–125	6	24	48
15	18 x 100		36	48
15	18 x 120		27	48
30	18 x 180			24
30	24–25 x 105–120		12	18
50	28.5 x 107	6		18
50	29.5 x 117		8	18
50	34 x 100	6	8	12
100	45 x 100–120		6	8/12
MT-plate	86 x 128 x 20		2	4 x 3
DW-plate	86 x 128 x 40			4

Chemical Resistant Diaphragm Vacuum Pumps / Hybrid Vacuum Pumps

Chemical Resistant Diaphragm Vacuum Pumps / Hybrid Vacuum Pumps

Chemical membrane pumps are mechanical, oil free vacuum pumps. Final vacuum values of up to 2 mbar can be achieved depending on the type of pump used. They are particularly useful for solvents with low to medium level boiling points. The parts that come into contact with the substance are made of corrosion resistant materials and are resistant to chemically aggressive vapors and condensation. VARIO chemical pumping units allow for the automatic adjustment of the optimal working pressure for high evaporation rates.

The RC-6 chemical hybrid pump is the corrosion-proof combination of a two-staged rotary pump and a chemical resistant membrane pump. The end vacuum of up to 2 x 10^{-3} mbar makes this pump suitable for solvents with high boiling points.

Features

- high chemical resistance (parts in contact with samples made of PTFE compounds)
- high suction performance, even at low values
- gas-ballast valve avoids condensing inside the pump
- virtually 100% solvent recovery with emission condenser
- self-finding working pressure in VARIO models, reducing process-time by 30%
- runs quietly, compact form

	MZ 2C	PC 2002 Vario	PC 2001 Vario	RC-6
suction power (m^3/h)	1.7	2.5	1.6	6
final vacuum (mbar)	9	9	2	< 0.1
special features	· with or without emissions condenser (solvent-recovery vessel)	· with emissions condenser · vacuum control · automatic mode: self-adapting vacuum for shorter process times	· with emissions condenser · vacuum control · automatic mode: self adapting vacuum for shorter process times · low end vacuum level suitable for solvents with high boiling point	· with or without emissions condenser · low end vacuum level suitable for solvents with high boiling point (DMSO, NMP, DMF) · connection with cooling trap recommended

Cooling Traps for Larger Volumes

The rate of evaporation is not only influenced by the energy input, but also by the suction capacity of the diaphragm pump. It is significantly more efficient to use a cooling trap (cryo-pump), instead of bigger vacuum pumps. Processes involving water solutions benefit from cooling traps, organic solutions are less critical due to their higher vapour density. The larger evaporation area surface sample is what causes the "bottle-neck" in the pump, not the volume and number of the vials.

CT02-50 and CT 04-50

- 2 liters volume (CT02-50), 4 liters (CT04-50)
- condenser temperature -50°C
- easy solvent release drain valve
- LED display shows condenser temperature
- vacuum concentrator connection with chemical-resistant glass cover

Alpha 1-2 LD, Alpha 2-4 LD and LT-105

- volume 2 liters (Alpha 1-2 LD), 4 liters (Alpha 2-4 LD and LT-105)
- condenser temperature -60°C (Alpha 1-2 LD), -90°C (Alpha 2-4 LD), -105°C (LT-105)
- powerful ice condenser with internal condenser coils
- Lyo-Display (LD) system interface showing ice condenser temperature, vacuum display optional
- vacuum concentrator connection with chemical-resistant glass cover
- optional RS 232 data interface
- expandable into freeze-drying system

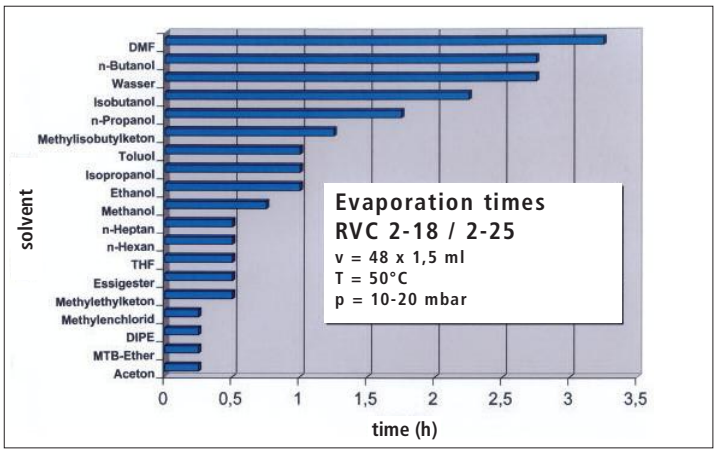
connection to freeze-drying system

- for example: connection to Alpha systems (with LD or LSC interface) please see separate product information
- directly connected to the drying chamber of the freeze dryer with a rubber valve

Examples for Evaporation Times

Evaporation time is dependent on the type of solvent used. As a rule, solvents with a low boiling point (i.e. DCM methylenchloride, chloroform, methanol, hexane) evaporate more easily and quickly than solvents with high boiling points (i.e. water, DMF, DMSO, NMP). Examples are shown in the table below.

The energy input into the product through the heating of the rotor chamber also influences evaporation. Evaporation time is reduced through this source, particularly in solvents with high boiling points (also water-based substances). The remaining product stays cool as the solvent's temperature remains low through evaporation.



Used for following solvents:	solvents low to middle boiling points	solvents high boiling points (in conjunction with vacuum pumps and cooling traps)	special RVC 2-18 system
	· acetronitril (ACN) · acetone · chloroform · dioxin · methylenchloride (DCM) · ethanol (EtOH) · hexane (Hex) · methanol (MeOH) · TFA · water	· dimethylsulfoxide (DMSO) · NMP · dioxane · t-butanol	· hydrochloric acid (HCl)

Technical Data

	RVC 2-18 CD	RVC 2-25 CD	RVC 2-33 CD
Rotor speed (min^{-1})	1500	1350	1550
Relative centrifugal force (rcf)	210	235	500
max. allowed imbalance (g)	20	30	50
Temperatur range (°C)	+ 30 bis + 60	+ 30 bis + 60	+ 30 bis + 60 (80)
Process vacuum depending on pump system, max. (mbar)	< 0.1	< 0.1	< 0.1
Dimensions (mm, w x h x d)	240 x 240 x 325	315 x 260 x 460	390 x 315 x 480
Weight (kg)	14	21	25
Electrical connection (V/Hz) (other voltages available)	230/50–60	230/50–60	230/50–60
Max. power consumption (kVA)	0.5	0.9	0.9
Max. current (A)	2	3.5	5.5
Max. ambient temperature, climate category SN (°C) (higher temperatures upon request)	+ 10 bis + 32	+ 10 bis + 32	+ 10 bis + 32
Sound emission acc. to DIN 45635 (dB/A)	40	44	45
Vacuum connection, small flange	DN 16 KF	DN 16 KF	DN 25 KF
Suggested vacuum pumps (other combinations possible)	MZ 2C PC 2002 Vario PC 2001 Vario	MZ 2C PC 2002 Vario PC 2001 Vario	MZ 2C PC 2002 Vario PC 2001 Vario
suggested cooling traps (other combinations possible)	CT 02-50 direrectly to freeze dryer	CT 02/04-50 ALPHA 1-2 / 2-4 LT 105 direrectly to freeze dryer	CT 04-50 ALPHA 2-4

please note: cooling traps are not absolutely necessary when using chemical resistant diaphragm pumps, but are recommended with samples > 100 ml in order to decrease evaporation time

We reserve the right to make technical changes without prior notice

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Product Spectrum

Our comprehensive product range of freeze dryers and vacuum concentrators for every application. Do not hesitate to contact us for an individual configuration of your system.

Freeze dryers for industrial production

Pilot systems for process development and optimization

Freeze dryers for research and development

Rotational vacuum concentrators, available in 4 sizes, covering the gamut from solving routine laboratory problems to the evaporation in high-end pharmaceutical research

Freeze dryers for routine laboratory use

Martin Christ Gefriertrocknungsanlagen GmbH
P.O.B. 17 13 · D-37507 Osterode am Harz
Tel. +49 (0) 55 22/50 07-0 · Fax +49 (0) 55 22/50 07-12
www.martinchrist.de e-mail: info@martinchrist.de