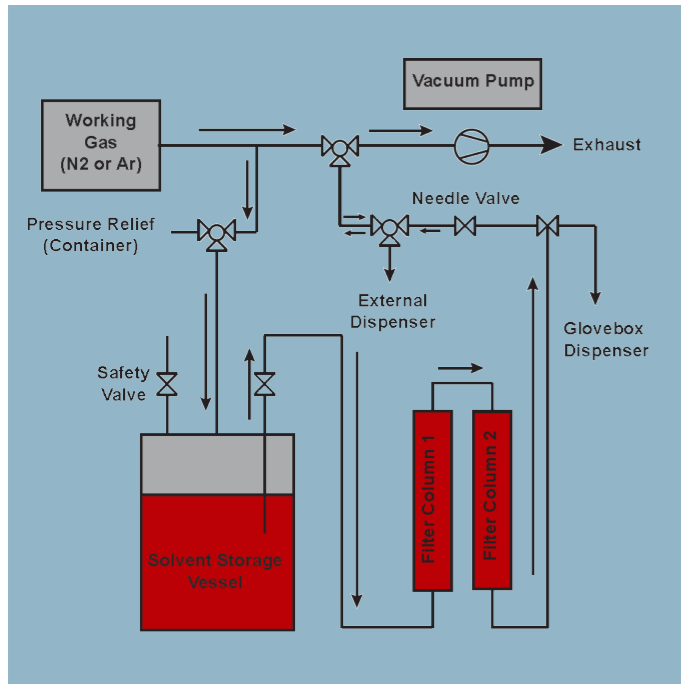


# Solvent Purification Systems

SAFE & ECONOMIC DRYING OF SOLVENTS



- Complete systems ready to operate
- Safe alternative to distilling
- Quick collection of ultra-pure solvents
- Purifies up to 7 solvents per system
- Purifies up to 800 liters with one loading of the filter columns
- Connect directly to a MBRAUN glovebox or use as a stand alone unit
- Fire safety storage cabinet for flammable liquids ensure lab safety



**Operation**

MBRAUN offers the safest, fastest and easiest way to dispense ultra dry solvents. MBRAUN SPS systems provide laboratories with unique safety features and benefits, specifically designed to meet the needs of the customer.

The MBRAUN Solvent Purification System operates by way of solvent storage vessels being pressurized through an inert gas supply (Typically a nitrogen source of 99.99% purity or better).

The solvent rises through the dip tube and flows through a series of two filter columns that absorb moisture from the solvent.

Ultra dry solvents are then dispensed into evacuated collection vessels directly at the system and/or into an integrated glovebox system.

Exhausted purifier columns are disposed of by the customer and activated replacement columns are provided by MBRAUN.

Figure A. Shows the gas and solvent flow through-out the system

**MBRAUN Solvent Purification System Features:**

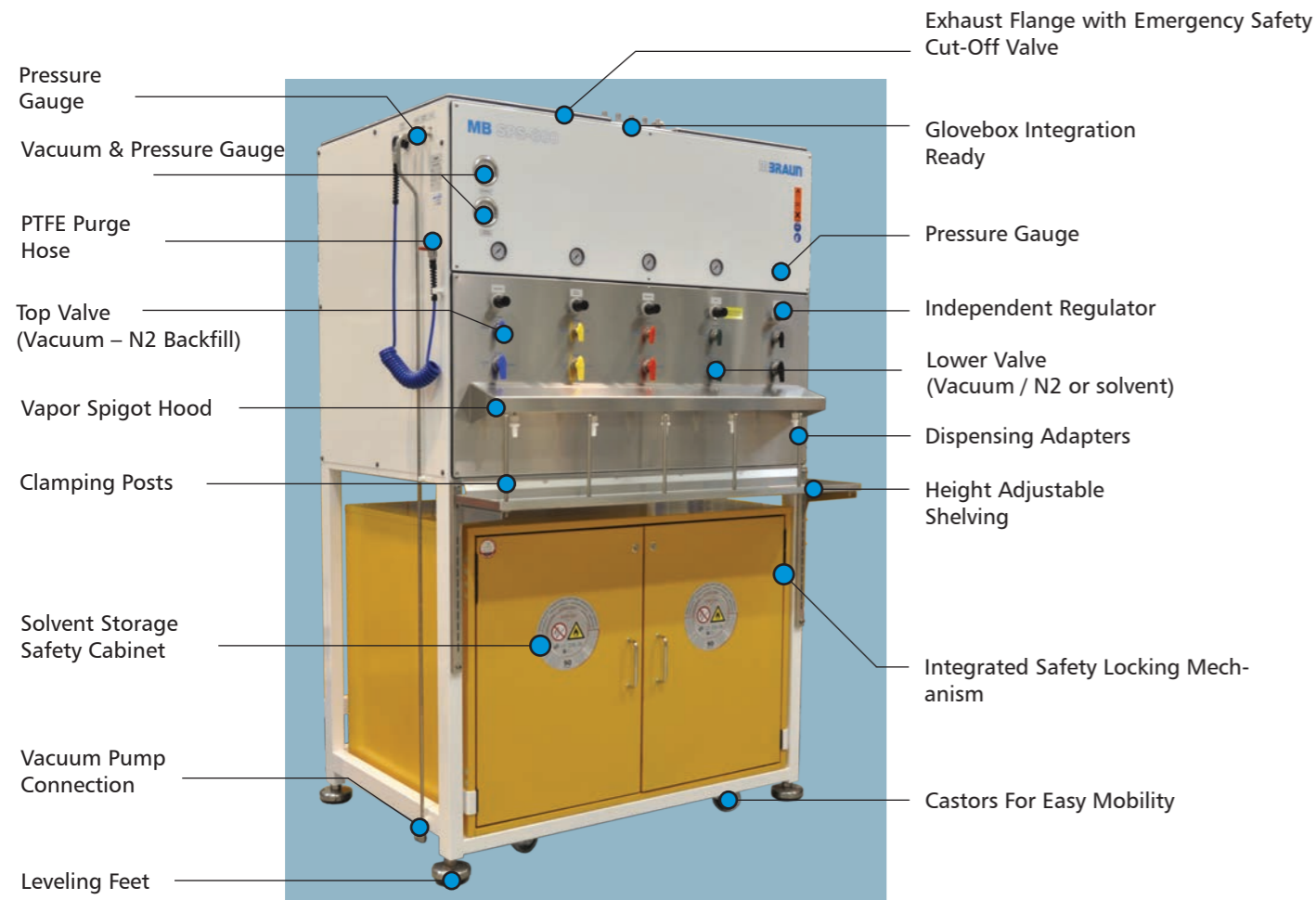


Figure B. Shows the basic system configuration of an MBRAUN SPS-5. System configuration, color and flammable cabinet specification may vary.

**SPS5 - SPS7**

**Description**

The MB SPS is designed specifically for laboratories that need a safe, fast and easy method for dispensing ultra dry solvents.

Unique features include glovebox integration ready piping, integrated vapor hood with 4 inch ventilation exhaust port, double column filtration, 17 liter solvent reservoir and independent regulators for each solvent line.

Up to 7 solvents reservoirs can be fitted into the system.

**Standard Features**

- Purifies up to 800 liters of solvent before replacing columns\*
- Connects directly to any glovebox system
- Ready to operate completely encapsulated system
- Fire resistant storage cabinet ensures laboratory safety
- Each solvent line includes an independent regulator
- No cross contamination of solvent vapors



**SPS COMPACT**

**Description**

The MB SPS Compact is a single solvent purification system specifically designed for customers who require a compact more economical setup in their solvent purification needs.

The compact design and high quality construction gives customers the ability to dispense ultra dry solvents directly from the laboratory bench top.

**Standard Features**

- Purifies up to 800 liters of solvent before replacing columns\*
- Connects directly to any glovebox system
- Ready to operate completely encapsulated system



\*Solvent filter column capacity varies according to solvent type and quality of solvent being used.



SPS<sup>COMPACT</sup>



SPS5



SPS7

	Encapsulated Solvent Purification System		Encapsulated Solvent Purification System	
	SPS COMPACT	SPS5	SPS5	SPS7
Type	Encapsulated Solvent Purification System		Encapsulated Solvent Purification System	
Dimensions	275 mm x 873 x 520 mm (W x H x D)		(SPS-5) 1300 x 1040 x 2063 mm (W x D x H)	(SPS-7) 1700 x 1040 x 2063 (W x D x H)
Number of solvents lines	1		Up to 5 solvents	Up to 7 solvents
Operation	Hand valves		Hand valves	
Material	Stainless steel (1.4301 / US 304)		Stainless steel (1.4301 / US 304)	
Leveling feet	Included		Included	
Manifold	Stainless steel piping w/ three way hand valve		Stainless steel piping w/ three way hand valve	
Work shelf	-		Height adjustable rack w/ vertical clamping posts	
Positioning system	Jack stand for the correct positioning of the collection vessel		Vertical clamping posts	
Castors for easy mobility	-		Included	
Solvent flow rate	< 1 l/min		< 1 l/min	
Power	230V / 50-60Hz, 10 amps, 115v / 50-60 Hz, 15 amps		230V / 50-60Hz, 10 amps, 115v / 50-60 Hz, 15 amps	
Solvent storage safety cabinet	-		Cabinets available for 2, 5 and 7 solvent systems	
Solvent storage safety cabinet EU	-		Type 90 (EN 14470-1), Fire resistance up to 90 minutes	
Solvent storage safety cabinet US	-		Meets NFPA regulation code 30	
Vapor removal for dispensing area	-		DN 75 connection to exhaust system & emergency cut-off valve	
Vapor removal for the safety cabinet	-		DN 50 connection to exhaust system & emergency cut-off valve	
Dispensing	From the SPS system		From the SPS system, inside glovebox, or combination of both	
Working gas	Nitrogen or argon (typically a nitrogen source of 99.99% purity or better)		Nitrogen or argon (typically a nitrogen source of 99.99% purity or better)	
Solvent regulation pressure	Individual regulation for each solvent line, 0.3 - 0.5 bar		Individual regulation for each solvent line, 0.3 - 0.5 bar	
Solvent line material	Stainless steel line (1.4301 / us 304)		Color coded stainless steel line (1.4301 / US 304)	
Inlet pressure	Inlet pressure set between 4.0 bar and 6.0 bar		Inlet pressure set between 4.0 bar and 6.0 bar	
Working pressure	Set between 0.3 bar and 0.5 bar		Set between 0.3 bar and 0.5 bar	
Filter type	Double column solvent filtration		Double column solvent filtration	
Filter column	Two stainless steel columns (1.4301 / US 304)		Two stainless steel columns per solvent (1.4301 / US 304)	
Filter column size	4.8 l (1 gallon)		4.8 l (1 gallon)	
Particle filtration	Filter columns equipped w/ pre-filters		Filter columns equipped w/ pre-filters	
Filter material	Depends on solvent type		Depends on solvent type	
Filter column capacity	Up to 800 l (depends on solvent type)		Up to 800 l (depends on solvent type)	
Filter column activation	Columns activated before shipment		Columns activated before shipment	
Attainable purity	Below a few ppm H2O and O2, varies according to solvent type		Below a few ppm H2O and O2, varies according to solvent type	
Reservoir material	Stainless steel reservoir (1.4301 / US 304)		Stainless steel reservoir (1.4301 / US 304)	
Reservoir capacity	17 l		17 l	
Reservoir features	Two shut off valves, Swagelok connectors, over pressure relief valve		Two shut off valves, Swagelok connectors, over pressure relief valve	
Reservoir piping	Stainless steel jacket and 1/4" piping w/ Swagelok fittings		Stainless steel jacket and 1/4" piping w/ Swagelok fittings	
Vacuum pump	Oil free diaphragm vacuum pump, resistant to aggressive gases (reinforced with a PTFE layer)		Oil free diaphragm vacuum pump, resistant to aggressive gases (reinforced with a PTFE layer)	
Options	Glass ware storage flask		Glass ware storage flask	
	250 ml		250 ml	



MB SPS-5 and MB SPS-7 are also available in bench-top version.  
**Note: This device is not available for sale in Europe.**

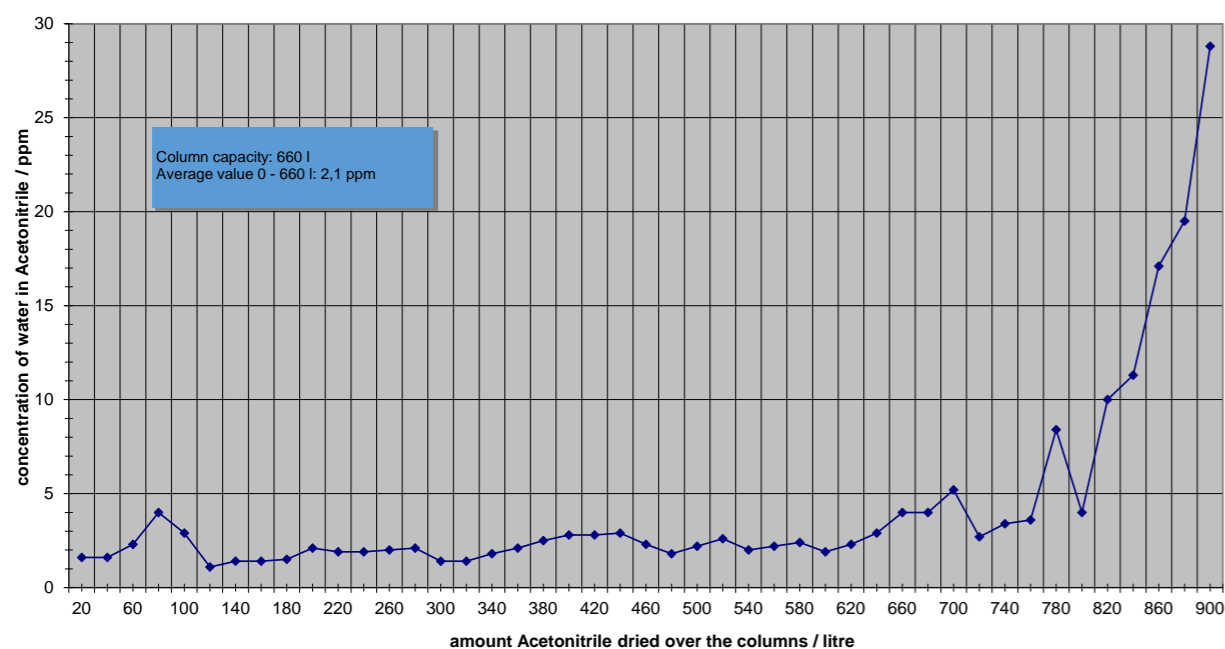


Example of Integration in a Glovebox

Solvent	Type	Water concentration in solvent feed	Mean value of residual water after drying	Capacity of the columns
n-Hexane	Aliphatic hydrocarbon	53 ppm	<1 ppm	Theoretical 9000 l
Toluene	Aromatic hydrocarbon	302 ppm	<2 ppm	1090 l
Dichloromethane	Halogenated hydrocarbon	436 ppm	<1 ppm	500 l
Acetonitrile	Dipolar aprotic solvent	560 ppm	<5 ppm	660 l
THF - Inhibitor free	Ether	550 ppm	~10-15 ppm	400 l

Please Note: Test results may vary, these results were operated in an inert glovebox workstation.

**SPS column capacity for Acetonitrile**  
(feed concentration of water in Acetonitrile approx. 556 ppm)



List of Solvents Purified		
Acetic Acid	Diethyl Ether *	Methylcyclohexane
Acetic Anhydride	Diethylene Glycol Dimethyl Ether	N,N-Methylpyrrolidone
Acetic Acid Ethyl Ester, Ethyl Acetate	Diisopropylamine (DIPA)*	Nitromethan
Acetic Acid Methyl Ester	Diisopropyl Ether	Pentane
Acetone *	Dimethylbenzene	Petroleum Ether
Acetonitrile	N,N-Dimethylformamide (DMF)	1-Propanol
Benzene	Dimethyl Sulfoxide (DMSO)	2-Propanol
1-Butanol	1,4-Dioxane	1,2 Propylene Carbonate
2-Butanol	Dipropylamine	Pyridine
tert-Butanol	Dipropyl Ether	Tetrachloromethane
t-Butyl Methyl Ether	N-Ethyl-diisopropylamine	THF - Inhibitor free
Chlorobenzene	Ethylene Glycol Dimethyl Ether	Tetramethylethanediamine
Chloroform	Formic Acid Ethyl Ester	Toluene
Chloromethane	n-Heptane, n-Hexane	Triethylamine
Dichloromethane *	2-Methoxyethanol	Xylene
More on request, please contact MBRAUN		

(\*) Notes:  
For Diethyl Ether, Dichloromethane or Chloroform: if it contains a stabilizer this may be removed partly by the drying procedure.  
For Acetone: please contact us. Side reaction due to Aldol condensation may occur during the drying procedure.

Glossary	Definition
Dispensing	Dispensing solvent is performed using a three step process. The first step involves evacuating the collection vessel to create a dry environment. The second step is the actual dispensing. Step three clears the line, so solvent does not remain stored in the dispensing line while the system is not in use.
Solvent Storage Reservoir	MBRAUN includes a 17 liter solvent storage reservoir per solvent line along with the SPS system. (Additional vessel sizes available upon request) Each storage vessel is equipped with connections for bubble degassing procedure. MBRAUN solvent reservoirs include an overpressure valve, solvent supply line, nitrogen push line and a dip tube assembly with clamp. MBRAUN SPS systems can also hook up directly to any third party solvent keg system.
Working Gas	MBRAUN SPS Systems are pressurized by an inert working gas (Typically a nitrogen source of 99.99% purity or better) with a minimum working pressure of 4 bars.
Filter Column	MBRAUN utilizes a double filter column per solvent. The filter column is designed to absorb the moisture from organic solvents and is equipped with pre-filters and a quick connection system for easy replacement once the column is fully saturated. New fully activated columns are available as spare parts.
Exhaust	The SPS system is equipped with two connections for exhaust (located at the top of the SPS system and at the rear side of the solvent storage safety cabinet) to be connected with customer's ventilation system.
PTFE-Purge Hose	The PTFE-Purge Hose is located on the left side wall of the system and is connected to the working gas. The purge hose is equipped with an adapter and a manual valve. The purpose of the purge hose is to clear the solvent line after dispensing.
Vacuum Pump	MBRAUN provides an oil free diaphragm pump as an optional item on all SPS systems. Customers may utilize other vacuum systems as well, including facilities vacuum system.
Pressure Reducing Valve	The pressure reducing valve is utilized to adjust the secondary pressure for pressurizing the solvent reservoirs. The pressure depends upon the viscosity of the solvent being used as well as the intended flow rate during dispensing. The permitted pressure range is 0.3 to 0.5 bar (30 to 50 kPa).
The Top Valve	The top valve opens/closes the connection to the vacuum pump and the working gas (N2 or Ar) which is used to purge out and back fill the collection vessel.
The Lower Valve	The lower valve dispenses ultra dry solvents into collection vessels that have been purged with the working gas via the top valve.
Degassing	The degassing process removes dissolved air from solvents by purging with inert gas (Nitrogen). Degassing is performed after installing the solvent reservoir inside the safety cabinet. The exhaust of the safety cabinet should be connected to the laboratory ventilation system during degassing, so that any solvent vapor released during purging is safely removed.
Clamping Posts and Shelving	Stainless steel clamping posts and shelving are standard features on the MB SPS 5 or 7 and the MB SPS AUTO. Clamping posts are used to secure the collection vessels for dispensing solvents. The stainless steel work shelf offers a height adjustable work space to which the clamping post are connected to.
Vapor Spigot Hood	MBRAUN offers an integrated vapor hood that connects directly to customers supplied HVAC system via a 4" port located at the top of the system.
Solvent Collection Vessel (Glassware)	Glassware is used to dispense ultra dry solvents into. Specially designed glassware for the MBRAUN SPS system are available.
Dispensing Adapters	MBRAUN offers NS 29/32 6 mm ground neck-fitting made from fluorocarbon polymer and/or glass, for connection to piping with an outer diameter of Ø 6 mm, with screw nut made from polypropylene (PP).
Glovebox Integration	All MBRAUN SPS systems have the option to dispense ultra dry solvents directly at the system or into an existing glovebox. Optional items include piping solvent lines directly through the glovebox or coming through the KF 40 vacuum feedthrough.



Safety Cabinet



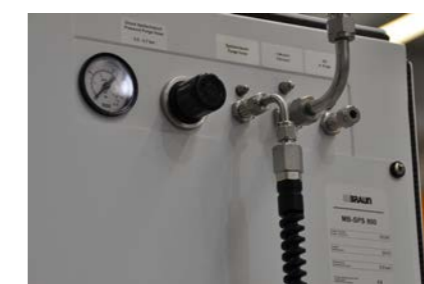
Solvent Storage Reservoir



Filter Columns



Exhaust on the top, and optional connectors for integration to a glovebox



Side wall with PTFE-Purge Hose, Gas Inlet, Main Pressure Reduction Valve



Example of Integration in a Glovebox



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