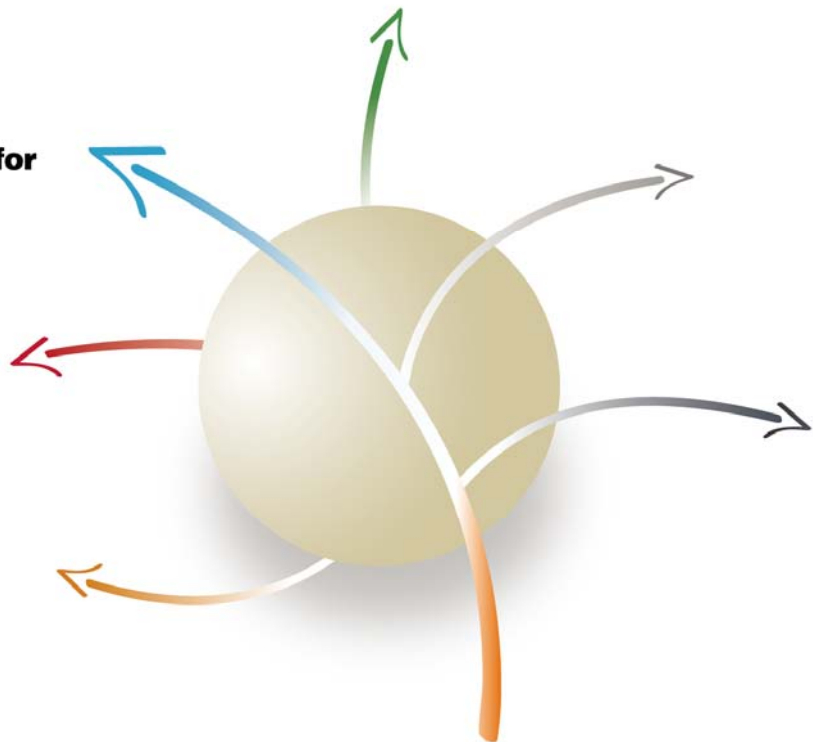


# ReliSorb™

Highly porous hydrophilic  
chromatographic resins

**ReliSorb™**

Chromatographic resins for  
biopolymers purification



**Resindion** S.r.l.

A Subsidiary of  MITSUBISHI CHEMICAL

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## Introduction

The use of high purity active compounds is a key requirement in all therapeutic applications. Liquid column chromatography is the elective technique to achieve this target, able to remove the by-products made during the manufacturing processes and to permit a constant and efficient industrial production of these molecules.

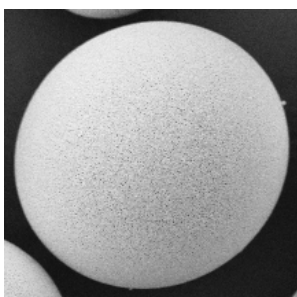
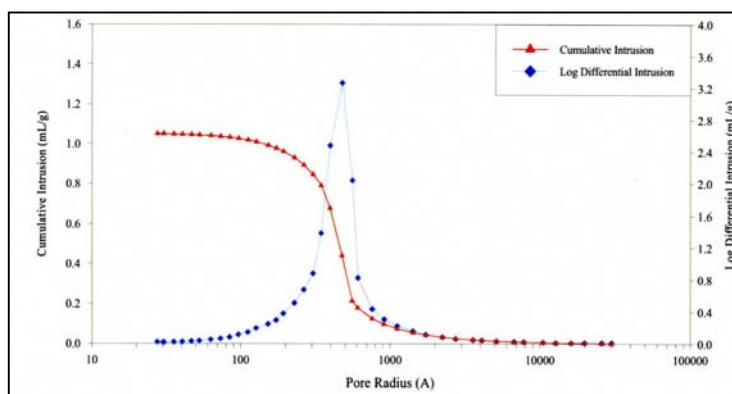
Resindion S.R.L., a subsidiary of Mitsubishi Chemical Corporation, offers a wide range of hydrophilic highly porous polymeric functionalized resins that, thank to the better interaction between the matrix and a given solute, permits the development of almost every conceivable chromatographic process.



## Technical information

### ReliSorb™ structure and synthesis

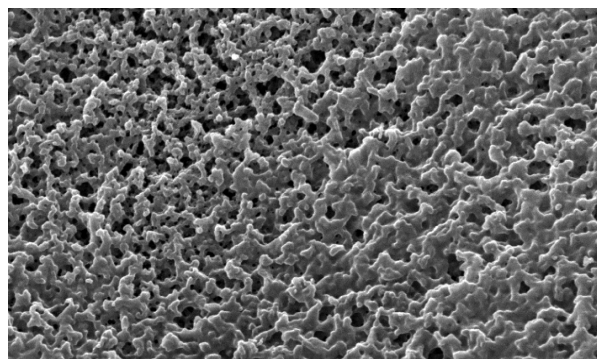
ReliSorb™ resins are based on a rigid low swelling hydrophilic polymethacrylate polymer characterised by a highly porous structure with an average pore radius of 40 – 50 nm.



ReliSorb™ are manufactured by a radical suspension polymerisation followed by the functionalization of the product thus obtained.

During the polymerization, highly porous opaque beads are formed with a calibrated particle size range.

Porogenic agents are able to dissolve the monomers but precipitate the synthesized polymer. The result is a sponge-like structure with free accessible inner surface.



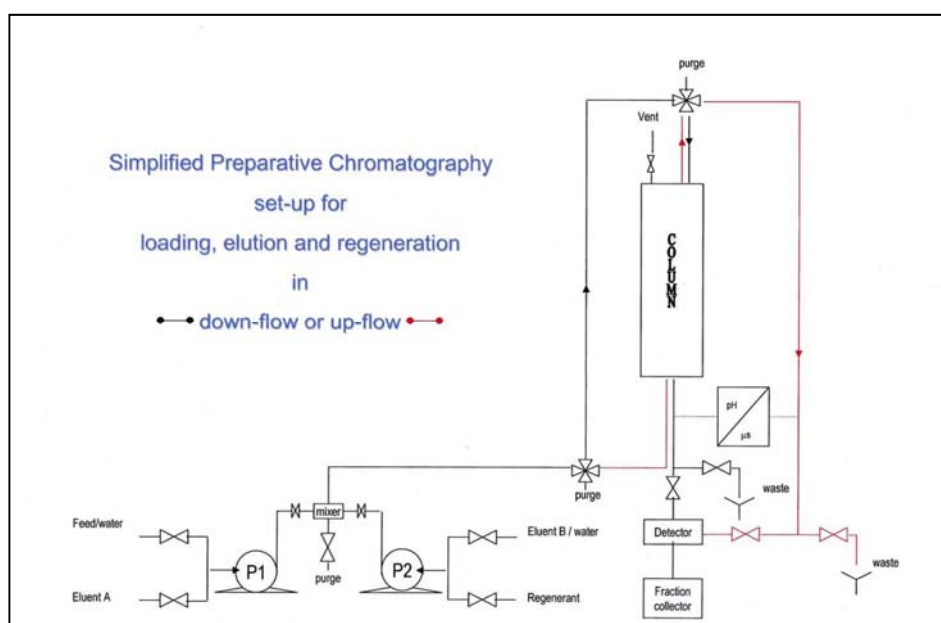
SEM of highly porous ReliSorb™

## ReliSorb™ characteristics

### Particle size

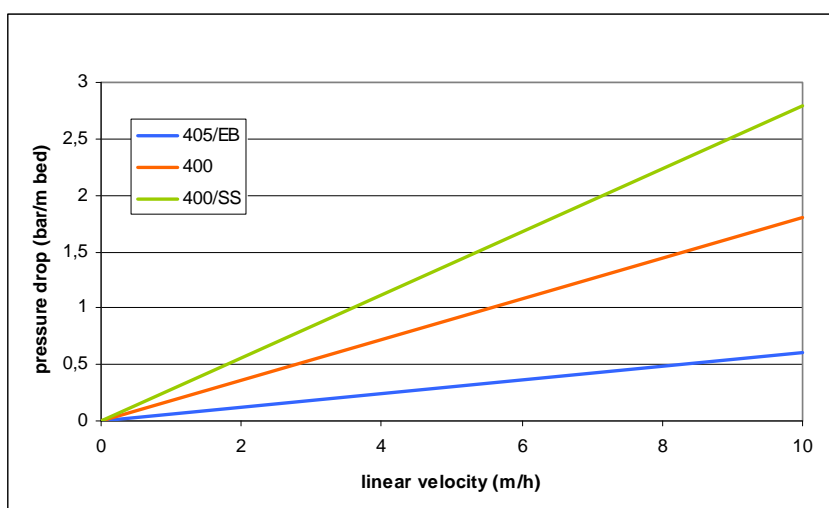
- ReliSorb™ 400/SS grade: 50 – 150  $\mu\text{m}$
- ReliSorb™ 400 grade: 75 – 200  $\mu\text{m}$
- ReliSorb™ 405/EB grade: 200 – 500  $\mu\text{m}$

These particle size ranges have been selected for the optimal design of fixed and expanded bed industrial columns used in the capture, intermediate and polishing purification steps.



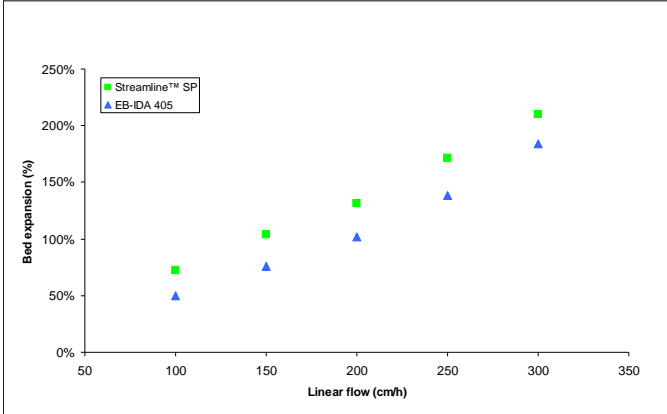
### Pressure drop in water at 25°C

Pressure drop per meter of bed depth in function of the linear velocity for the different types of available ReliSorb™. The slope of the curves increases as the particle size range becomes smaller.



## Bed Expansion

The high specific gravity (> 1.1 g/ml) of **ReliSorb™ 405/EB**, associated to a calibrated particle size range, allows to a controlled bed expansion and a fast settlement.



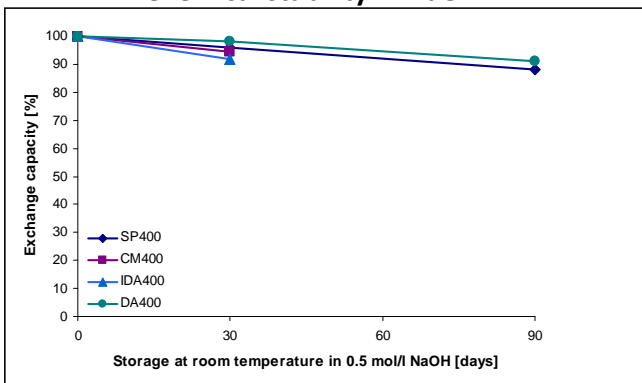
**ReliSorb™ 405/EB** shows a performance similar to that of Streamline™ beads (G.E. Healthcare product).

## ReliSorb™ stability tests

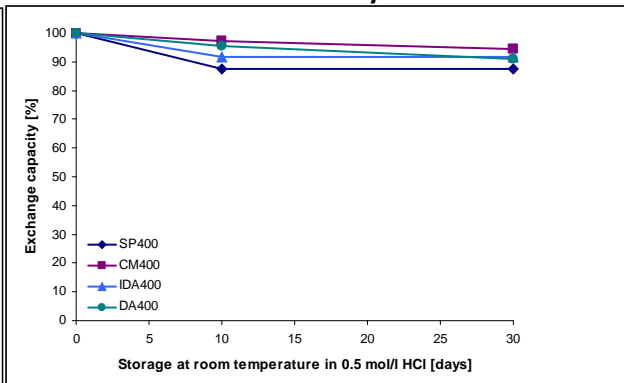
**ReliSorb™** resins are characterised by an excellent stability in all operational range of pH and in all common solvents.

### Chemical stability

Chemical stability in NaOH

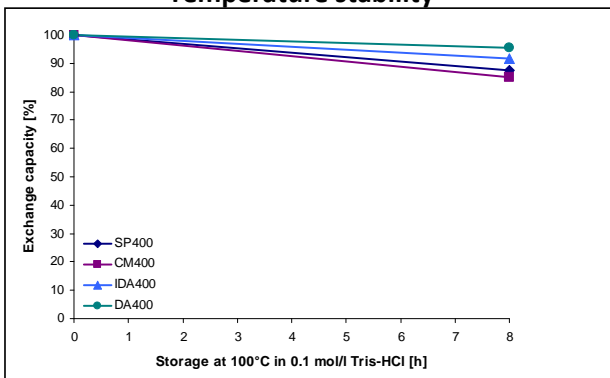


Chemical stability in HCl

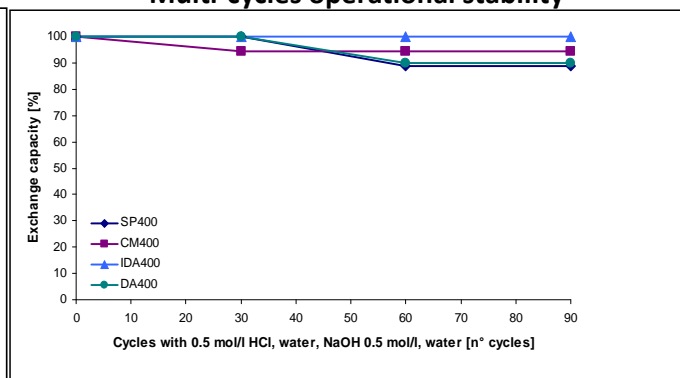


### Physical stability

Temperature stability

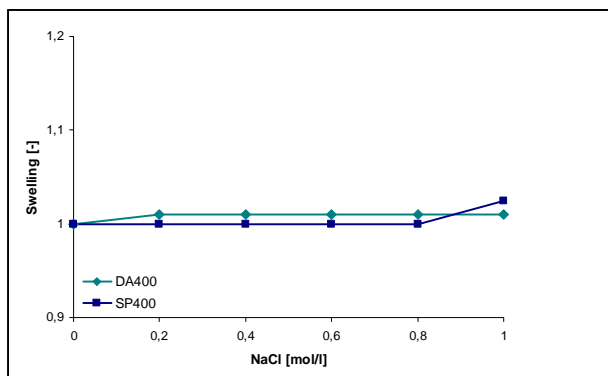


Multi-cycles operational stability

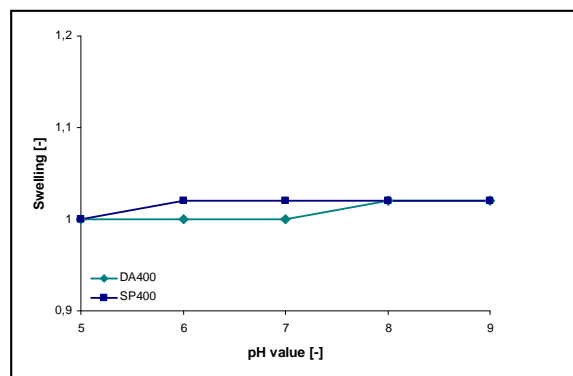


ReliSorb™ are mechano-osmotically stable and very limited volume changes are observed under salt gradient and pH.

Swelling by salts



Swelling by pH changes



## ReliSorb™ products line

ReliSorb™ are available in bulk from 250 ml up to 25 l standard packing suspended in storage solution, with the exception of ReliSorb™ EP, which is supplied in wet form.

	ReliSorb™ 50 – 150 µm	ReliSorb™ 75 – 200 µm	ReliSorb™ 200 – 500 µm	Storage solution at delivery
<b>Ion Exchange Resins</b>	CM400/SS	CM400	CM405/EB	EtOH 20% aqueous solution + NaCl (final concentration 150 mM)
	SP400/SS	SP400	SP405/EB	
	DA400/SS	DA400	DA405/EB	
	QA400/SS	QA400	QA405/EB	
<b>Hydrophobic Interactions Resins</b>	PH400/SS	PH400	PH405/EB	EtOH 20% aqueous solution
	BU400/SS	BU400	BU405/EB	
	OC400/SS	OC400	OC405/EB	
	OD400/SS	OD400	OD405/EB	
<b>Affinity resins</b>	EP400/SS	EP400	EP405/EB	Wet form
	HG400/SS	HG400	HG405/EB	EtOH 20% aqueous solution
	IDA400/SS	IDA400	IDA405/EB	EtOH 20% aqueous solution + NaCl (final concentration 150 mM)
	SA400/SS	SA400	SA405/EB	EtOH 20% aqueous solution + NaCl (final concentration 150 mM)
	LA400/SS	LA400	LA405/EB	EtOH 20% aqueous solution + NaCl (final concentration 150 mM)

ReliSorb™400/SS resins are also supplied as ReliChrom™ pre-packed columns

# ReliSorb™

## Ion Exchange resins



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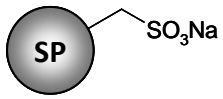
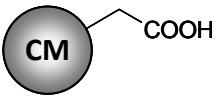
Ion exchange chromatography is the most common method applied for the separation and the purification of biomolecules.

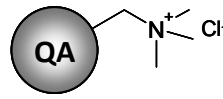
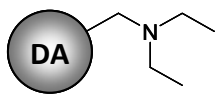
The electrostatic interaction between a charged solute and a counter charge covalently bounded onto the resin is the base of this method of purification.

The use of a weak ion exchanger is determined by the ionization degree at the pH value at which the bio-molecule has a net charge. On the contrary, strong ion exchangers, being completely ionized, can be used over a wide range of pH.

In theory, a weak cation exchanger should be used above pH 5.0 - 5.5, while a weak anion one at pH below 8.0 - 8.5.

A raw solution with low conductivity is preferably loaded on a buffered resin, while a low molarity buffer with salt gradient or pH change is used for the elution.

Strong cation exchanger	Weak cation exchanger
Functional group <b>-SO<sub>3</sub>Na</b>	Functional group <b>-COOH</b>
	

Strong anion exchanger	Weak anion exchanger
Functional group <b>-N<sup>+</sup>R<sub>3</sub>Cl<sup>-</sup>, R = CH<sub>3</sub></b>	Functional group <b>-NR<sub>2</sub>, R = CH<sub>2</sub>CH<sub>3</sub></b>
	

## Purchase Information

Product name	Code	Pack size (liters)	Particle size (µm)	IEC (meq/ml)
SP400/SS	11374X	0.05	50-150	min 0.1
	11374W	0.1		
	113740	0.25		
	113741	0.5		
	113742	1.0		
	113743	5.0		
	113744	10.0		
	113749	≥ 25		
SP400	11364X	0.05	75-200	
	11364W	0.1		
	113640	0.25		
	113641	0.5		
	113642	1.0		
	113643	5.0		
	113644	10.0		
	113649	≥ 25		
SP405/EB	11394X	0.05	200-500	
	11394W	0.1		
	113940	0.25		
	113941	0.5		
	113942	1.0		
	113943	5.0		
	113944	10.0		
	113949	≥ 25		
CM400/SS	11174X	0.05	50-150	min 0.15
	11174W	0.1		
	111740	0.25		
	111741	0.5		
	111742	1.0		
	111743	5.0		
	111744	10.0		
	117449	≥ 25		
CM400	11164X	0.05	75-200	
	11164W	0.1		
	111640	0.25		
	111641	0.5		
	111642	1.0		
	111643	5.0		
	111644	10.0		
	111649	≥ 25		
CM405/EB	11194X	0.05	200-500	
	11194W	0.1		
	111940	0.25		
	111941	0.5		
	111942	1.0		
	111943	5.0		
	111944	10.0		
	111949	≥ 25		

<b>QA400/SS</b>	<b>12474X</b>	<b>0.05</b>	<b>50-150</b>	<b>min 0.2</b>
	12474W	0.1		
	124740	0.25		
	124741	0.5		
	124742	1.0		
	124743	5.0		
	124744	10.0		
	124749	≥ 25		
<b>QA400</b>	<b>12464X</b>	<b>0.05</b>	<b>75-200</b>	
	12464W	0.1		
	124640	0.25		
	124641	0.5		
	124642	1.0		
	124643	5.0		
	124644	10.0		
	124649	≥ 25		
<b>QA405/EB</b>	<b>12494X</b>	<b>0.05</b>	<b>200-500</b>	
	12494W	0.1		
	124940	0.25		
	124941	0.5		
	124942	1.0		
	124943	5.0		
	124944	10.0		
	124949	≥ 25		
<b>DA400/SS</b>	<b>12374X</b>	<b>0.05</b>	<b>50-150</b>	<b>min 0.3</b>
	12374W	0.1		
	123740	0.25		
	123741	0.5		
	123742	1.0		
	123743	5.0		
	123744	10.0		
	123749	≥ 25		
<b>DA400</b>	<b>12364X</b>	<b>0.05</b>	<b>75-200</b>	
	12364W	0.1		
	123640	0.25		
	123641	0.5		
	123642	1.0		
	123643	5.0		
	123644	10.0		
	123649	≥ 25		
<b>DA405/EB</b>	<b>12394X</b>	<b>0.05</b>	<b>200-500</b>	
	12394W	0.1		
	123940	0.25		
	123941	0.5		
	123942	1.0		
	123943	5.0		
	123944	10.0		
	123949	≥ 25		

# ReliSorb™

## Hydrophobic interaction chromatography

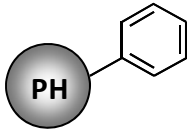
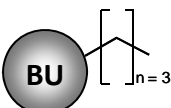
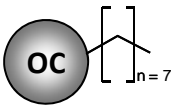
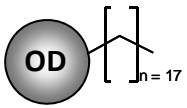


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Hydrophobic Interaction Chromatography (HIC) is a chromatographic technique frequently used for the separation of biomolecules on the basis of the hydrophobic interactions between the stationary phase and the compounds to be separated.

The level of hydrophobicity of the target molecule that has to be separated is the guidance for the selection of the most appropriate **ReliSorb™** HIC resin. To enhance it, a high amount of salt is added to the loading raw solution to reduce the molecule solvation and thus increase the interaction with the HIC resin functionalized with mild hydrophobic groups (phenyl, butyl, octyl and octadecyl groups) (see the table below).

Functional group -Phenyl	Functional group -Butyl	Functional group -Octyl	Functional group -Octadecyl
			

As the ionic strength of the buffer solution decreases, the hydrophilic region of the target molecule become exposed and desorption/elution is obtained. Sometimes elution may also be completed by adding mild organic modifier or detergent to the low molarity elution buffer.

## Purchase Information

Product name	Code	Pack size (liters)	Particle size (µm)	Std protein capacity (mg/ml BSA)
PH400/SS	13474X	0.05	50-150	min 30
	13474W	0.1		
	134740	0.25		
	134741	0.5		
	134742	1.0		
	134743	5.0		
	134744	10.0		
	134749	≥ 25		
PH400	13464X	0.05	75-200	
	13464W	0.1		
	134640	0.25		
	134641	0.5		
	134642	1.0		
	134643	5.0		
	134644	10.0		
	134649	≥ 25		
PH405/EB	13494X	0.05	200-500	
	13494W	0.1		
	134940	0.25		
	134941	0.5		
	134942	1.0		
	134943	5.0		
	134944	10.0		
	134949	≥ 25		
BU400/SS	13274X	0.05	50-150	min 30
	13274W	0.1		
	132740	0.25		
	132741	0.5		
	132742	1.0		
	132743	5.0		
	132744	10.0		
	132749	≥ 25		
BU400	13264X	0.05	75-200	
	13264W	0.1		
	132640	0.25		
	132641	0.5		
	132642	1.0		
	132643	5.0		
	132644	10.0		
	132649	≥ 25		
BU405/EB	13294X	0.05	200-500	
	13294W	0.1		
	132940	0.25		
	132941	0.5		
	132942	1.0		
	132943	5.0		
	132944	10.0		
	132949	≥ 25		

<b>OD400/SS</b>	<b>13374X</b>	<b>0.05</b>	<b>50-150</b>	<b>min 20</b>
	13374W	0.1		
	133740	0.25		
	133741	0.5		
	133742	1.0		
	133743	5.0		
	133744	10.0		
	133749	≥ 25		
<b>OD400</b>	<b>13364X</b>	<b>0.05</b>	<b>75-200</b>	
	13364W	0.1		
	133640	0.25		
	133641	0.5		
	133642	1.0		
	133643	5.0		
	133644	10.0		
	133649	≥ 25		
<b>OD405/EB</b>	<b>13394X</b>	<b>0.05</b>	<b>200-500</b>	
	13394W	0.1		
	133940	0.25		
	133941	0.5		
	133942	1.0		
	133943	5.0		
	133944	10.0		
	133949	≥ 25		

# ReliSorb™

## Affinity chromatography



**Resindion** S.r.l.

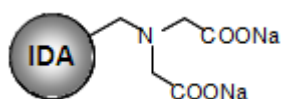
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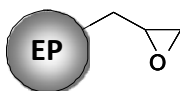
Affinity chromatography is a separation technique based on a highly specific physical-chemical interaction between the resin and a target molecule.

**ReliSorb™** for affinity chromatography include three types of resins:

- **ReliSorb™ IDA**, with an iminodiacetic acid functional group on the surface, generally used for metal chelating chromatography;



- **ReliSorb™ EP**, functionalized with an epoxy group, suitable for a further covalent binding of a specific ligand;



- **ReliSorb™ HG** (with two hydroxyl groups), **ReliSorb™ SA** and **LA** (with a primary amino group linked respectively to a short and a long carbon chain): for this category of resins, the active type is suitable for an “in house” special activation.

<b>Functional group -OH</b>	
<b>Functional group -CH<sub>2</sub>NH<sub>2</sub></b>	<b>Functional group -(CH<sub>2</sub>)<sub>n</sub>NH<sub>2</sub></b>

**ReliSorb™** ready to use resins with specific ligands already immobilized are available upon request.

## Purchase Information

Product	Code	Pack size (liters)	Particle size (µm)	Ni <sup>2+</sup> loading
IDA400/SS	11274X	0.05	50-150	min 100 µmol Ni/ml
	11274W	0.01		
	112740	0.25		
	112741	0.5		
	112742	1.0		
	112743	5.0		
	112744	10.0		
	112749	≥ 25		
IDA400	11264X	0.05	75-200	
	11264W	0.1		
	112640	0.25		
	112641	0.5		
	112642	1.0		
	112643	5.0		
	112644	10.0		
	112649	≥ 25		
IDA405/EB	11294X	0.05	200-500	
	11294W	0.1		
	112940	0.25		
	112941	0.5		
	112942	1.0		
	112943	5.0		
	112944	10.0		
	112949	≥ 25		
<b>Reactive group density</b>				
EP400/SS	10174X	0.05	50-150	min 100 µmol/g dry
	10174W	0.1		
	101740	0.25		
	101741	0.5		
	101742	1.0		
	101743	5.0		
	101744	10.0		
	101749	≥ 25		
EP400	10164X	0.05	75-200	
	10164W	0.1		
	101640	0.25		
	101641	0.5		
	101642	1.0		
	101643	5.0		
	101644	10.0		
	101649	≥ 25		
EP405/EB	10194X	0.05	200-500	
	10194W	0.1		
	101940	0.25		
	101941	0.5		
	101942	1.0		
	101943	5.0		
	101944	10.0		
	101949	≥ 25		

Active group density				
HG400/SS	13174X	0.05	50-150	Approx. 100 $\mu\text{mol/g}$ dry
	13174W	0.1		
	131740	0.25		
	131741	0.5		
	131742	1.0		
	131743	5.0		
	131744	10.0		
	131749	$\geq 25$		
HG400	13164X	0.05	75-200	
	13164W	0.1		
	131640	0.25		
	131641	0.5		
	131642	1.0		
	131643	5.0		
	131644	10.0		
	131649	$\geq 25$		
HG405/EB	13194X	0.05	200-500	
	13194W	0.1		
	131940	0.25		
	131941	0.5		
	131942	1.0		
	131943	5.0		
	131944	10.0		
	131949	$\geq 25$		
LA400/SS	12274X	0.05	50-150	min 500 $\mu\text{mol/g}$ wet
	12274W	0.1		
	122740	0.25		
	122741	0.5		
	122742	1.0		
	122743	5.0		
	122744	10.0		
	122749	$\geq 25$		
LA400	12264X	0.25	75-200	
	12264W	0.1		
	122640	0.25		
	122641	0.5		
	122642	1.0		
	122643	5.0		
	122644	10.0		
	122649	$\geq 25$		
LA405/EB	12294X	0.05	200-500	
	12294W	0.1		
	122940	0.25		
	122941	0.5		
	122942	1.0		
	122943	5.0		
	122944	10.0		
	122949	$\geq 25$		

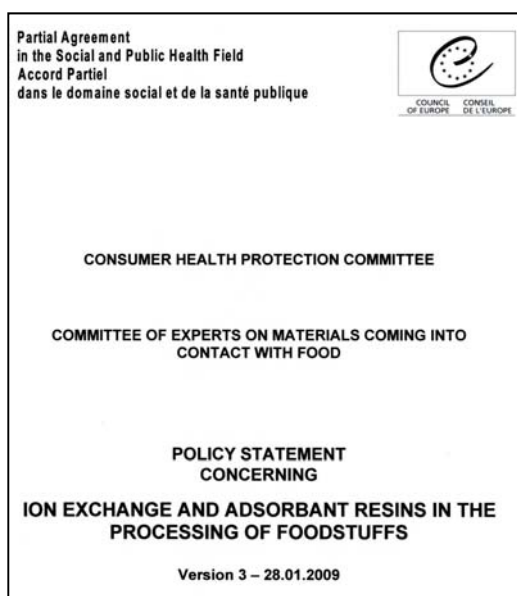
<b>SA400/SS</b>	<b>12174X</b>	<b>0.05</b>	<b>50-150</b>	<b>min 500 µmol/g wet</b>
	12174W	0.1		
	121740	0.25		
	121741	0.5		
	121742	1.0		
	121743	5.0		
	121744	10.0		
	121749	≥ 25		
<b>SA400</b>	<b>12164X</b>	<b>0.05</b>	<b>75-200</b>	
	12164W	0.1		
	121640	0.25		
	121641	0.5		
	121642	1.0		
	121643	5.0		
	121644	10.0		
	121649	≥ 25		
<b>SA405/EB</b>	<b>12194X</b>	<b>0.05</b>	<b>200-500</b>	
	12194W	0.1		
	121940	0.25		
	121941	0.5		
	121942	1.0		
	121943	5.0		
	121944	10.0		
	121949	≥ 25		

## ReliSorb™ Material Support File



Resindion S.R.L., an UNI EN ISO 9001:2008 certified Company, offers the following regulatory documents for each product:

- technical data sheet and relevant technical literature
- certificate of analysis
- material safety data sheet



All substances used for the manufacture of **ReliSorb™** are selected among those reported in the European Resolution ResAP (2004) 3 Version 3 – 28.01.2009, which is related to the resins that can be used in the processing of foodstuffs.

### Handling and storage

Users are requested to observe the generally accepted precautions for handling of chemicals and to follow the health and safety recommendations set out in each **ReliSorb™** MSDS.

**ReliSorb™** EP has to be stored at 4–6°C and for no longer than six months.

### Technical assistance

Resindion S.R.L. qualified technical and marketing team guarantees all the necessary customer assistance, from **ReliSorb™** selection to a periodical analytical control of the products characteristics during operation. Please consult Resindion at: [technicalservice@resindion.com](mailto:technicalservice@resindion.com).

# Resindion S.r.l.

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