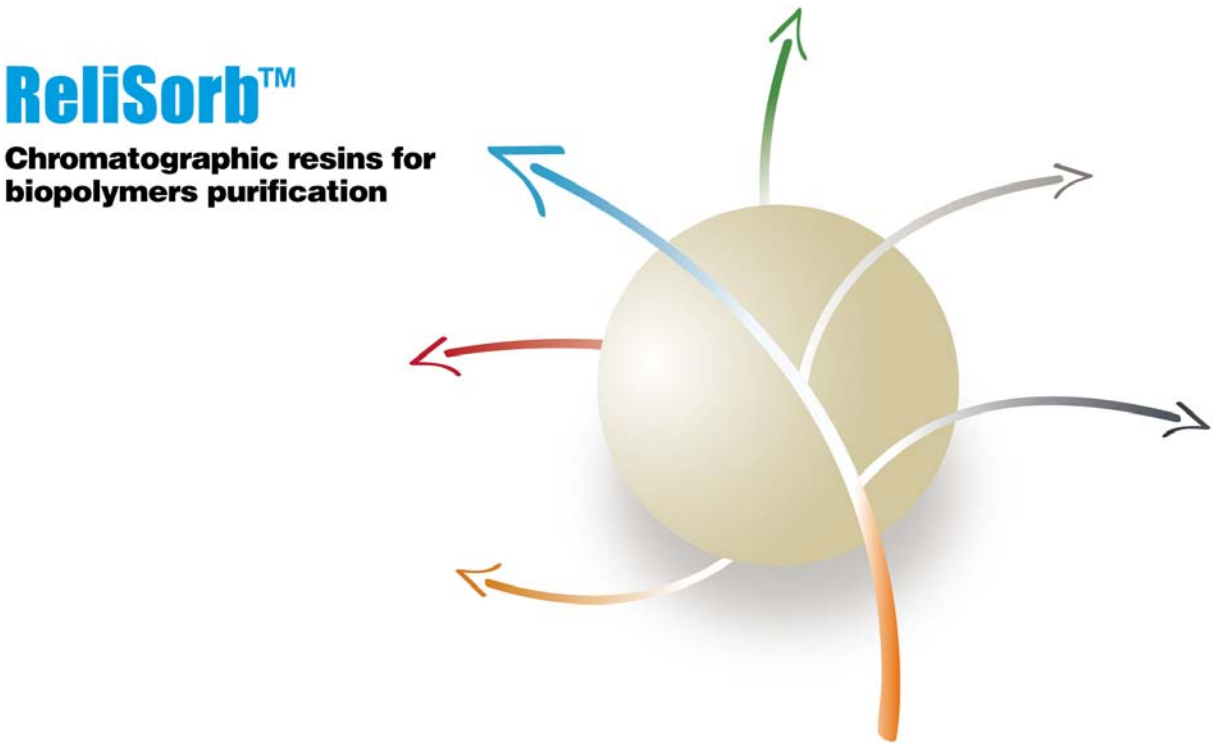
ReliSorb™

Highly porous hydrophilic chromatographic resins



PGD 241110

Introduction

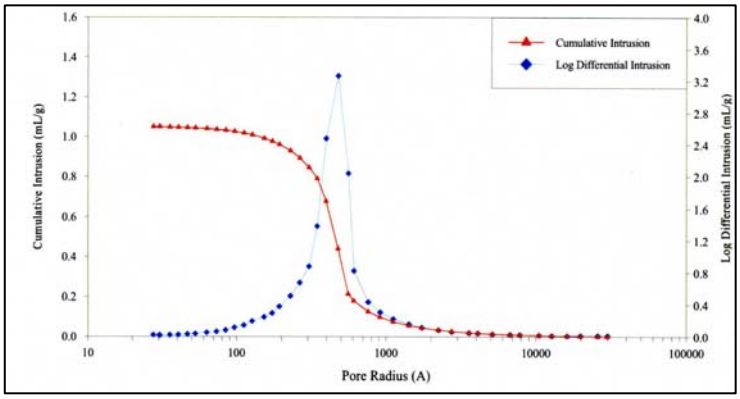
The use of high purity active compounds is a key requirement in all therapeutic applications.
Liquid column chromatography is the elective technique to achieve this target, able to remove the by-products made during the manufacturing processes and to permit a constant and efficient industrial production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

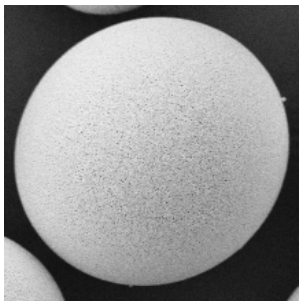
Resindion S.R.L., a subsidiary of Mitsubishi Chemical Corporation, offers a wide range of hydrophilic highly porous polymeric functionalized resins that, thank to the better interaction between the matrix and a given solute, permits the development of almost every conceivable chromatographic process.

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.

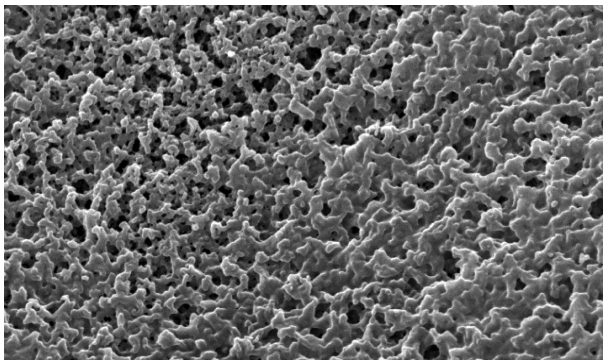




ReliSorb™ are manufactured by a radical suspension polymerisation followed by the functionalization of the product thus obtained.

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.



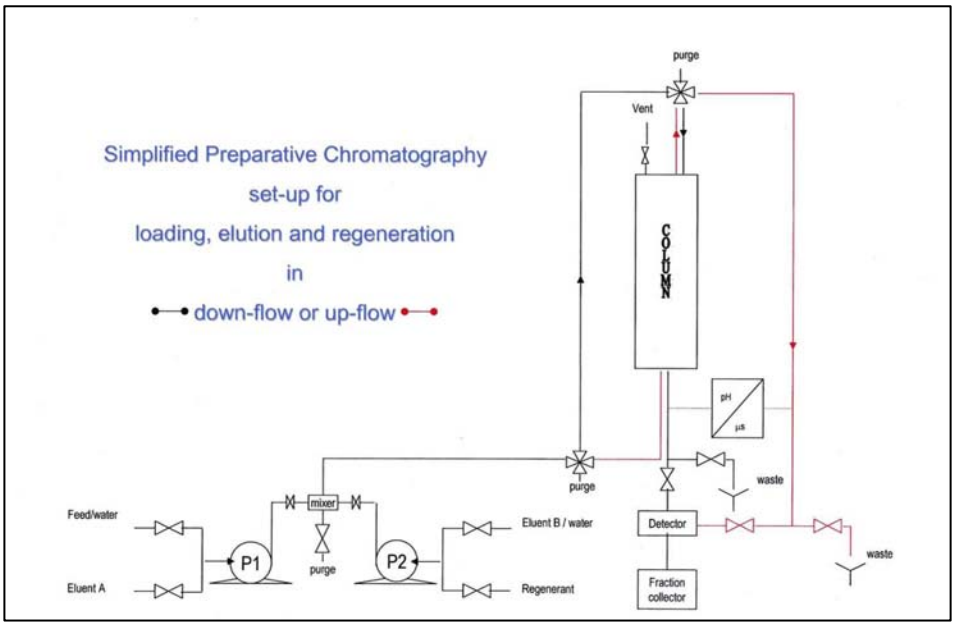
SEM of highly porous ReliSorb™

ReliSorb™ characteristics

Particle size

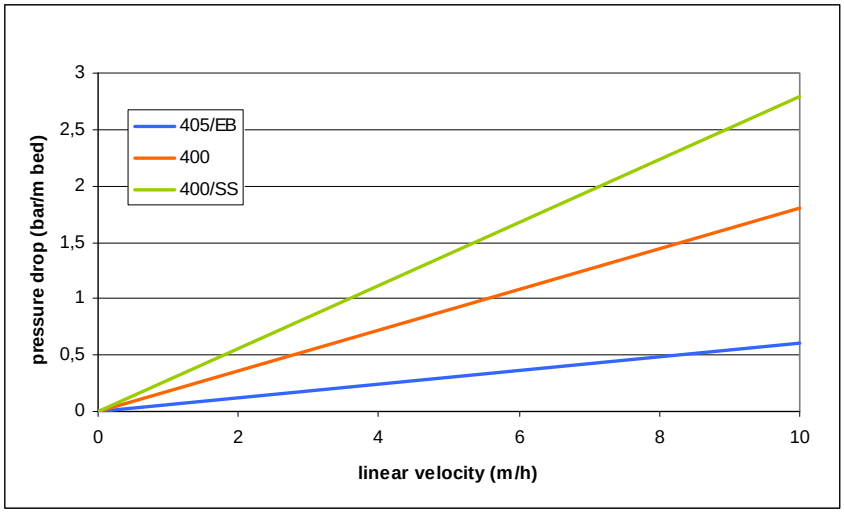
- ReliSorb™ 400/SS grade: 50 – 150 µm
- ReliSorb™ 400 grade: 75 – 200 µm
- ReliSorb™ 405/EB grade: 200 – 500 µm

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.



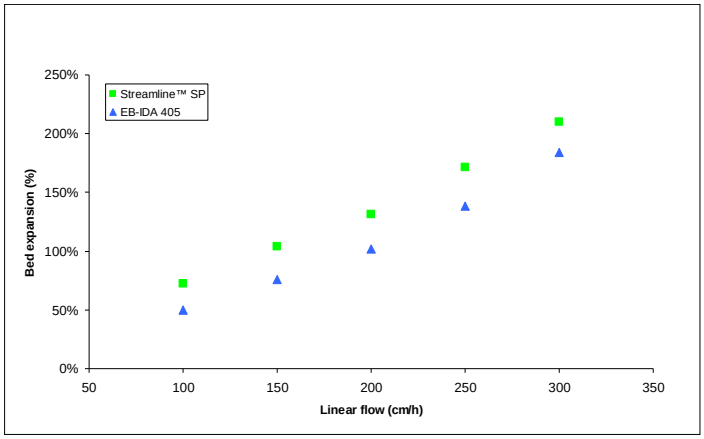
Pressure drop in water at 25°C

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.



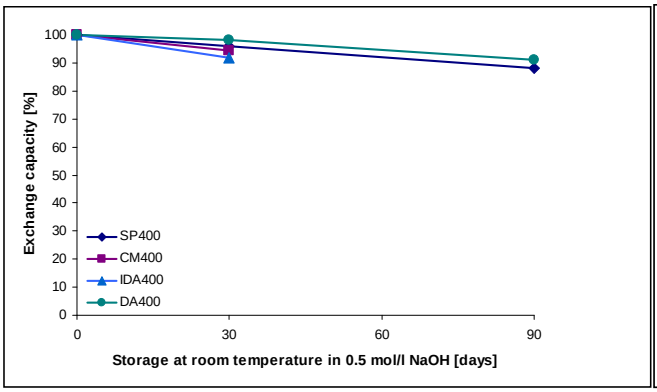
ReliSorb™ 405/EB are equivalent to Streamline™ beads (G.E. Healthcare product).

ReliSorb™ stability tests

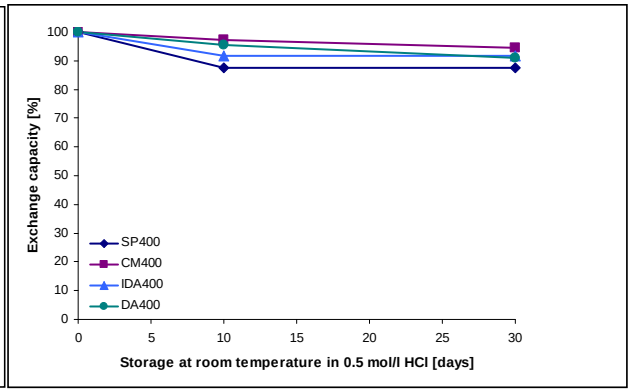
ReliSorb™ resins are characterised by an excellent stability in all operational range of pH and in all common solvents.

Chemical stability

Chemical stability in NaOH

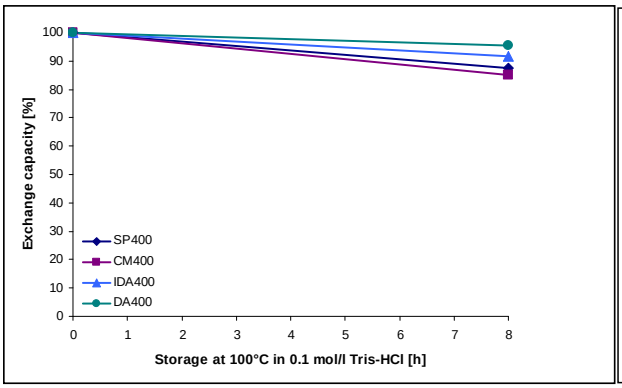


Chemical stability in HCl

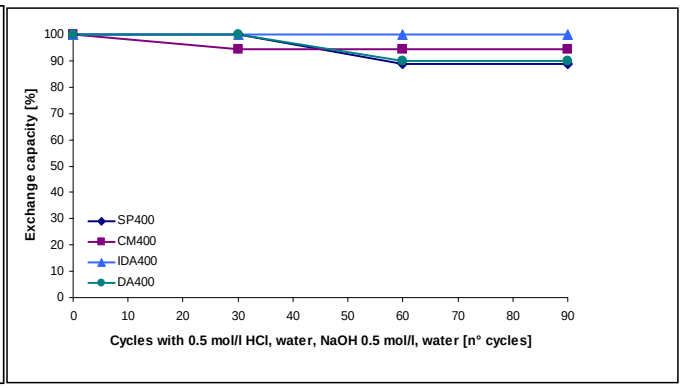


Physical stability

Temperature stability

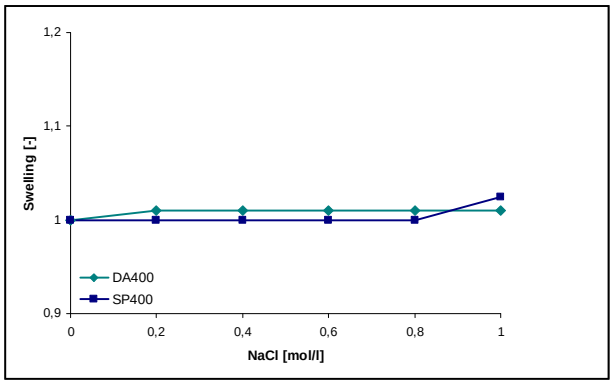


Multi-cycles operational stability

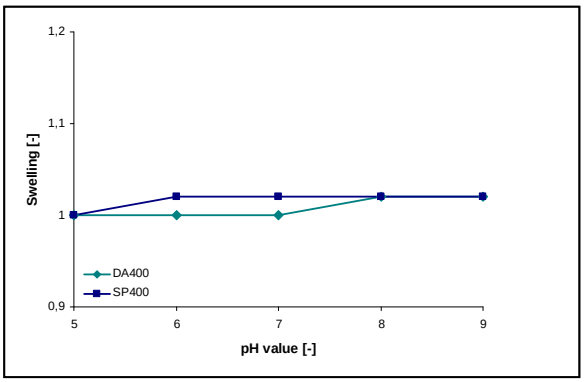


ReliSorb™ are mechano-osmotically stable and very limited volume changes are observed under salt gradient and pH.

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**
Ion Exchange Resins	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	
Hydrophobic Interactions Resins	PH400/SS	PH400	PH405/EB	EtOH 20% aqueous solution
	BU400/SS	BU400	BU405/EB	
	OD400/SS	OD400	OD405/EB	
Affinity resins	HG400/SS	HG400	HG405/EB	
	IDA400/SS	IDA400	IDA405/EB	EtOH 20% aqueous solution + NaCl (final concentration 150 mM)
	EP400/SS	EP400	EP405/EB	Wet form
	SA400/SS	SA400	SA405/EB	EtOH 20% aqueous solution + NaCl (final concentration 150 mM)
	LA400/SS	LA400	LA405/EB	

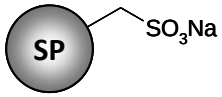
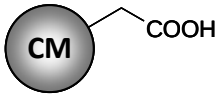
ReliSorb™400/SS resins are also supplied as **ReliChrom™** pre-packed columns

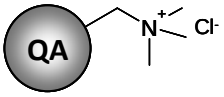
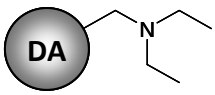
ReliSorb™

Ion Exchange resins

PGD 241110

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 conducibility 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 -SO_3Na	Functional group -COOH
	

Strong anion exchanger	**Weak anion exchanger**
Functional group -$N^+R_3Cl^-$, R = CH_3	Functional group -NR_2, R = CH_2CH_3
	

Purchase Information

Product name	Code	Pack size (liters)	Particle size (µm)	IEC (meq/ml)
SP400/SS	113740	0.25	50-150	min 0.1
	113741	0.5		
	113742	1.0		
	113743	5.0		
	113744	10.0		
	113749	≥ 25		
SP400	113640	0.25	75-200	
	113641	0.5		
	113642	1.0		
	113643	5.0		
	113644	10.0		
	113649	≥ 25		
SP405/EB	113940	0.25	200-500	
	113941	0.5		
	113942	1.0		
	113943	5.0		
	113944	10.0		
	113949	≥ 25		
CM400/SS	111740	0.25	50-150	min 0.15
	111741	0.5		
	111742	1.0		
	111743	5.0		
	111744	10.0		
	117449	≥ 25		
CM400	111640	0.25	75-200	
	111641	0.5		
	111642	1.0		
	111643	5.0		
	111644	10.0		
	111649	≥ 25		
CM405/EB	111940	0.25	200-500	
	111941	0.5		
	111942	1.0		
	111943	5.0		
	111944	10.0		
	111949	≥ 25		
QA400/SS	124740	0.25	50-150	min 0.3
	124741	0.5		
	124742	1.0		
	124743	5.0		
	124744	10.0		
	124749	≥ 25		
QA400	124640	0.25	75-200	
	124641	0.5		
	124642	1.0		
	124643	5.0		
	124644	10.0		
	124649	≥ 25		
QA405/EB	124940	0.25	200-500	
	124941	0.5		
	124942	1.0		
	124943	5.0		
	124944	10.0		
	124949	≥ 25		
DA400/SS	123740	0.25	50-150	min 0.3
	123741	0.5		
	123742	1.0		
	123743	5.0		
	123744	10.0		
	123749	≥ 25		

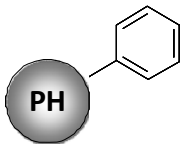
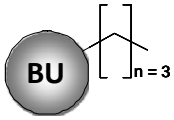
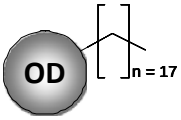
Product name	Code	Pack size (liters)	Particle size (µm)	IEC (meq/ml)
DA400	123640	0.25	75-200	
	123641	0.5		
	123642	1.0		
	123643	5.0		
	123644	10.0		
	123649	≥ 25		
DA405/EB	123940	0.25	200-500	
	123941	0.5		
	123942	1.0		
	123943	5.0		
	123944	10.0		
	123949	≥ 25		

ReliSorb™

Hydrophobic interaction chromatography

PGD 241110

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 and octadecyl groups) (see the table below).

Functional group -Phenyl	**Functional group -Butyl**	**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	134740	0.25	50-150	min 30
	134741	0.5		
	134742	1.0		
	134743	5.0		
	134744	10.0		
	134749	≥ 25		
PH400	134640	0.25	75-200	
	134641	0.5		
	134642	1.0		
	134643	5.0		
	134644	10.0		
	134649	≥ 25		
PH405/EB	134940	0.25	200-500	
	134941	0.5		
	134942	1.0		
	134943	5.0		
	134944	10.0		
	134949	≥ 25		
BU400/SS	132740	0.25	50-150	min 30
	132741	0.5		
	132742	1.0		
	132743	5.0		
	132744	10.0		
	132749	≥ 25		
BU400	132640	0.25	75-200	
	132641	0.5		
	132642	1.0		
	132643	5.0		
	132644	10.0		
	132649	≥ 25		
BU405/EB	132940	0.25	200-500	
	132941	0.5		
	132942	1.0		
	132943	5.0		
	132944	10.0		
	132949	≥ 25		
OD400/SS	133740	0.25	50-150	min 20
	133741	0.5		
	133742	1.0		
	133743	5.0		
	133744	10.0		
	133749	≥ 25		
OD400	133640	0.25	75-200	
	133641	0.5		
	133642	1.0		
	133643	5.0		
	133644	10.0		
	133649	≥ 25		
OD405/EB	133940	0.25	200-500	
	133941	0.5		
	133942	1.0		
	133943	5.0		
	133944	10.0		
	133949	≥ 25		

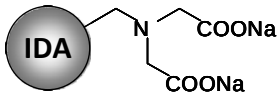
ReliSorb™

Affinity chromatography

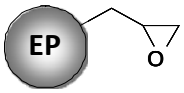
PGD 241110

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:

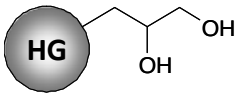
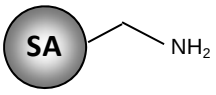
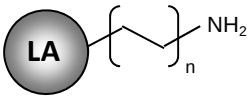
- **ReliSorb™ IDA**, with an iminodiacetic acid functional group on the surface, generally used for metal chelating chromatography;



- **ReliSorb™ EP**, functionalized with an epoxy group, suited 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 suited for an "in house" special activation.

Functional group -OH	
	
Functional group $-CH_2NH_2$	**Functional group** $-(CH_2)_nNH_2$
	

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^{2+} loading
IDA400/SS	112740	0.25	50-150	min 100 µmol Ni/ml
	112741	0.5		
	112742	1.0		
	112743	5.0		
	112744	10.0		
	112749	≥ 25		
IDA400	112640	0.25	75-200	
	112641	0.5		
	112642	1.0		
	112643	5.0		
	112644	10.0		
	112649	≥ 25		
IDA405/EB	112940	0.25	200-500	
	112941	0.5		
	112942	1.0		
	112943	5.0		
	112944	10.0		
	112949	≥ 25		
				Reactive group density
EP400/SS	101740	0.25	50-150	min 100 µmol/g dry
	101741	0.5		
	101742	1.0		
	101743	5.0		
	101744	10.0		
	101749	≥ 25		
EP400	101640	0.25	75-200	
	101641	0.5		
	101642	1.0		
	101643	5.0		
	101644	10.0		
	101649	≥ 25		
EP405/EB	101940	0.25	200-500	
	101941	0.5		
	101942	1.0		
	101943	5.0		
	101944	10.0		
	101949	≥ 25		
				Active group density
HG400/SS	131740	0.25	50-150	Approx. 100 µmol/g dry
	131741	0.5		
	131742	1.0		
	131743	5.0		
	131744	10.0		
	131749	≥ 25		
HG400	131640	0.25	75-200	
	131641	0.5		
	131642	1.0		
	131643	5.0		
	131644	10.0		
	131649	≥ 25		
HG405/EB	131940	0.25	200-500	
	131941	0.5		
	131942	1.0		
	131943	5.0		
	131944	10.0		
	131949	≥ 25		

				Active group density
LA400/SS	122740	0.25	50-150	min 500 µmol/g wet
	122741	0.5		
	122742	1.0		
	122743	5.0		
	122744	10.0		
	122749	≥ 25		
LA400	122640	0.25	75-200	
	122641	0.5		
	122642	1.0		
	122643	5.0		
	122644	10.0		
	122649	≥ 25		
LA405/EB	122940	0.25	200-500	
	122941	0.5		
	122942	1.0		
	122943	5.0		
	122944	10.0		
	122949	≥ 25		
SA400/SS	121740	0.25	50-150	min 500 µmol/g wet
	121741	0.5		
	121742	1.0		
	121743	5.0		
	121744	10.0		
	121749	≥ 25		
SA400	121640	0.25	75-200	
	121641	0.5		
	121642	1.0		
	121643	5.0		
	121644	10.0		
	121649	≥ 25		
SA405/EB	121940	0.25	200-500	
	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 standard product:

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


IQNet

THE INTERNATIONAL CERTIFICATION NETWORK

CERTIFICATE

IQNet and its partner
CISQ/CERTIQUALITY S.r.l.
hereby certify that the organization
RESINDION SRL

I - 20082 BINASCO (MI) - VIA ROMA 55
has implemented and maintains a
Quality Management System
which fulfils the requirements of the following standard
ISO 9001:2008
for the following activities Code EA 12
R&D, production,sales, trading and technical service of
enzyme carriers, solid phases for chromatographic separation and organic synthesis,
adsorbent and ion exchange resins.

In the following operative units
I - 20082 BINASCO (MI) - VIA ROMA 55

Issued on: 2009-07-28
Certified since: 1995-09-15
Expire on: 2011-06-30
Registration Number: IT-6795

René Wasmer
President of IQNet

Gianrenzo Prati
President of CISQ

IQNet partners*:
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CERTIQUALITY

ISTITUTO DI CERTIFICAZIONE DELLA QUALITÀ
CERTIFICATO n. 445
CERTIFICATE No

RESINDION SRL

I - 20082 BINASCO (MI) - VIA ROMA 55

UNI EN ISO 9001:2008

EA 12

Ricerca e sviluppo, produzione, vendita, commercializzazione ed assistenza tecnica di supporti per immobilizzazione enzimi, fasi solide per separazione cromatografica e sintesi organica, resine adsorbenti ed a scambio ionico.
R&D, production,sales, trading and technical service of enzyme carriers, solid phases for chromatographic separation and organic synthesis, adsorbent and ion exchange resins.

15/09/1995
28/07/2009
30/06/2011

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Partial Agreement
in the Social and Public Health Field
Accord Partiel
dans le domaine social et de la santé publique

COUNCIL OF EUROPE CONSEIL DE L'EUROPE

CONSUMER HEALTH PROTECTION COMMITTEE

COMMITTEE OF EXPERTS ON MATERIALS COMING INTO CONTACT WITH FOOD

POLICY STATEMENT
CONCERNING

ION EXCHANGE AND ADSORBANT RESINS IN THE PROCESSING OF FOODSTUFFS

Version 3 – 28.01.2009

ReliSorb™ monomers and porogenic agents are selected on the basis of what stated by the European Resolution RESAP (2004) 3 Version 3 – 28.01.2009.

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: info@resindion.com.