



HAISIL HL

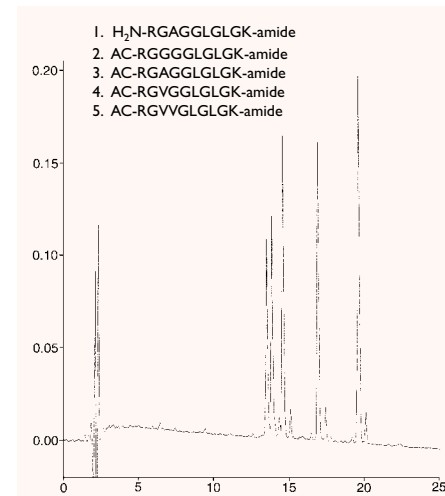
HAISIL HL "High Load"

| | |
|----------------|---|
| Phases | C18 |
| Particle Sizes | 3 and 5µm |
| Pore Size | 100Å |
| Pore Volume | 0.8mL/gm |
| Surface Area | 300m ² /gm |
| %Carbon (w/w) | C18 = 18% |
| Phase type | Monofunctional & fully endcapped |
| Silica Class | Type B |
| Hardware | Stainless steel and PEEK columns and cartridges |

Applications Haisil HL "high load" columns and cartridges are intended for applications requiring maximum loading and selectivity. The high surface area permits high bonded phase loading yet the monofunctional bonded phase and the absence of micro-pores eliminates the problems that plague many of the so-called "high capacity" columns currently on the market. The Type B silica backbone is pure, robust, and stable under harsh conditions. Users report satisfactory lifetime when used for prolonged periods at pH as high as 9.

HAISIL HL - "High Load" Columns
Often, a chromatographer needs to support the high sample throughput demands of real-time process control or large volume production monitoring. When maximum selectivity, high efficiency, and fast analysis times are called for, Haisil HL (high load) C18 is a good choice. The high surface area (300m²/gm) of the 100Å pore size silica used for Haisil HL permits high weight/weight carbon loading yet the same desirable monomeric characteristics of our other Haisil sorbents.

HPLC Peptide Standards for RP on the Haisil HL C18 Column
The aromatic hydrocarbons that most HPLC column manufacturers use to quality control columns render little informa-

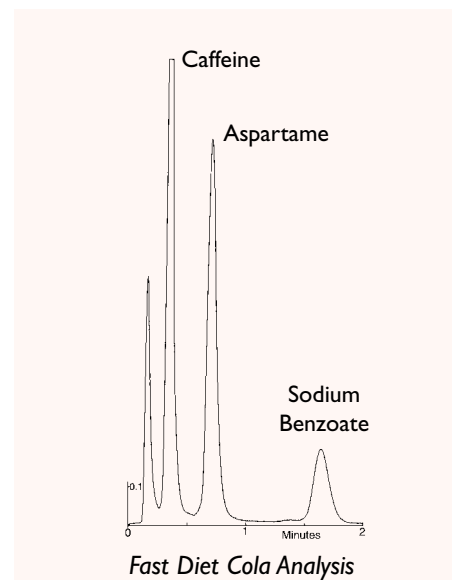


"Hodges Test Peptide Mix"
(from Synthetic Peptides, Inc.)
HAISIL HL C18 5µm
150x4.6mm P/N LS-1546-C185

tion about a column's selectivity and performance characteristics for peptides. The Canadian corporation, SPI, produces a well characterized yet challenging peptide mixture that is very useful for quantifying HPLC column performance for peptides. The difficult to separate first pair of peptides are resolved to near base line on Haisil HL C18 columns. Many so-called peptide analysis columns are unable to separate this pair.

Food Additives

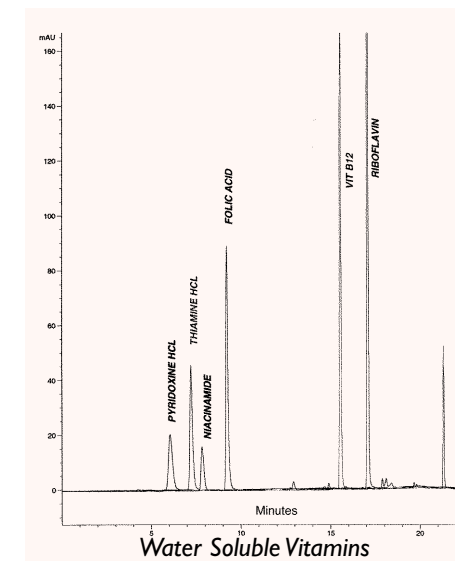
Beverage additive analysis is not only an important industrial application, but it also serves as a practical and relatively simple procedure for introductory HPLC courses. Industry is increasingly driven



Fast Diet Cola Analysis
HAISIL HL C18 5µm
2cm x 2.1mm Cartridge
P/N LK-0221-C185
15% MeCN/water 200µL/min

by rapid analysis requirements and an HPLC column can represent an overwhelming expense in a teaching environment. The diet cola analysis in the chromatogram to the left illustrates an extremely fast analysis on an extremely inexpensive HPLC column. A package containing five of the 20x2.1mm cartridge column used for this analysis costs about half as much as one moderately priced HPLC column. And, there's no need to pre-filter the cola sample through a 0.5µm filter as some column manufacturers recommend when using their expensive columns packed with 2µm particles for this analysis! The readily avail-

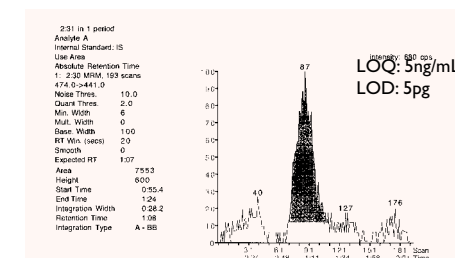
able and non-toxic nature of the sample and the low cost of Higgins Analytical cartridges has made the diet cola analysis an ideal choice for classroom purposes.



Water Soluble Vitamins
HAISIL HL C18 5µm 250x4.6mm
A: 0.05mM KOAc, pH5; B: MeCN
Gradient: 2.5% - 30%B in 25min

Cartridge Columns for LC/MS

With MS becoming the "detector of choice" for a rapidly increasing number of fortunate chromatographers, the need for dependable, efficient, and short HPLC columns has grown dramatically. Higgins Analytical offers a wide range of short, 2.1mm I.D. cartridge columns that are ideal for LC/MS applications. The figure below illustrates a routine LC/MS analysis of a 20µL serum sample on a 40x2.1mm HAIPEEK cartridge. These inexpensive cartridges are reported to have a several hundred cycle minimum life.

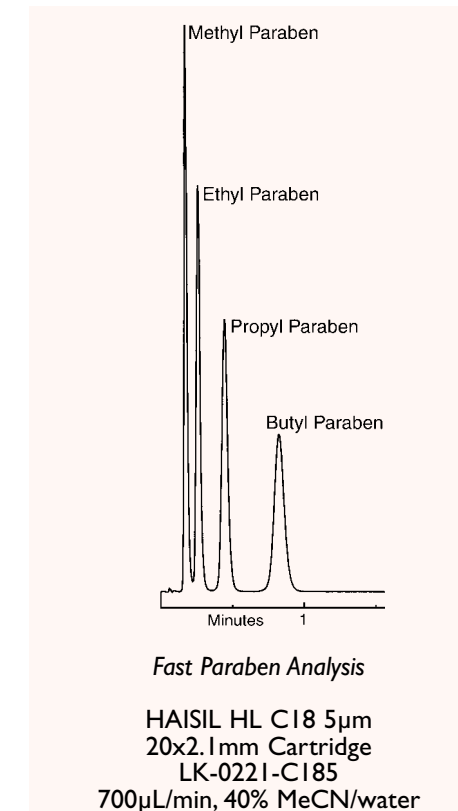


LC/MS of Serum Drug

HAISIL HL C18 5µm
40x2.1mm Cartridge
P/N LK-0421-C185
Sciex API3+

Paraben Food Preservatives

Parabens represent another example of food additives that are routinely analyzed by HPLC. Often, the food matrix being assayed for preservative content requires exhaustive cleanup and pre-filtration in order to prevent clogging of columns with nonporous or 2µm sorbents recently suggested for this analysis. As in the previous diet cola example, the compounds of interest are base line resolved under isocratic conditions. The inexpensive Haisil HL 5µm 20x2.1mm cartridge col-



Fast Paraben Analysis

HAISIL HL C18 5µm
20x2.1mm Cartridge
LK-0221-C185
700µL/min, 40% MeCN/water

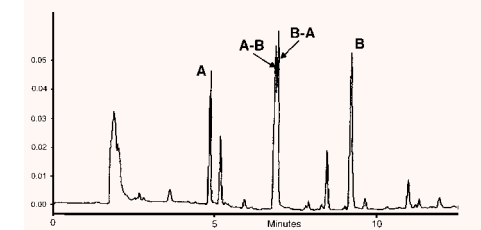
umn and the 50 second analysis time contribute significantly towards reducing operating costs.

Reverse Phase Chromatography of Basic Compounds in Combinatorial Mixtures

In the example at the top of the next column, A and B are single compounds containing two identical building blocks. A-B and B-A represent positional isomers, each containing two building blocks.

This analysis was conducted on the crude liquid-phase reaction mixture. Each component contains multiple secondary and tertiary amine functionality yet the com-

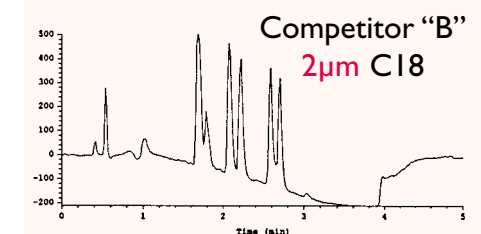
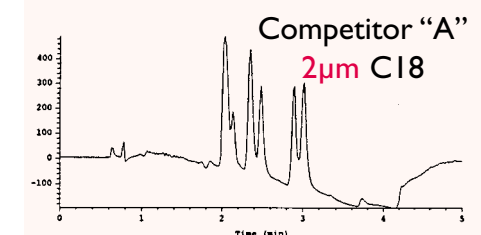
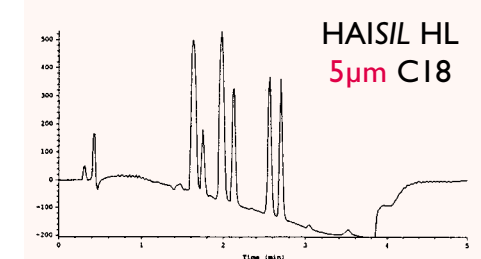
binatorial products can be rapidly chromatographed and exhibit no tailing on a 150x4.6mm Haisil HL C18 column using a simple linear 5% to 100% MeCN/water 0.1% TFA gradient.



Basic Compounds in
Combinatorial Mixtures
HAISIL HL C18
P/N LS-1546-C185

Speed and Selectivity for Ballistic Gradients on Complex Libraries

The relative importance of particle size and selectivity are graphically illustrated below by the high speed analysis of a six component combinatorial library on a Haisil HL C18 5µm column and two competitor's C18 2µm columns. Haisil HL with its high carbon loading and surface area of often works much better than expensive small particle size columns that are prone to plugging up more quickly.



Nanobore Columns

| | | |
|---|--|--|
| HAISIL HL C18 3µm 30x0.15mm LC-0315-C183 | 0.15mm I.D. 50x0.15mm LC-0515-C1835 | 100x0.15mm LC-1015-C183 |
| HAISIL HL C18 5µm 30x0.15mm LC-0315-C185 | 0.15mm I.D. 50x0.15mm LC-0515-C1855 | 100x0.15mm LC-1015-C185 150x0.15mm LC-1515-C185 |

Microbore Columns

| | | | |
|--|---|---------------------------|--|
| HAISIL HL C18 3µm 30x1.0mm LS-0301-C183 | 1.0mm - 0.5mm - 0.3mm I.D. 50x1.0mm LS-0501-C183 | 100x1.0mm LS-1001-C183 | 150x1.0mm LS-1501-C183 |
| 30x0.5mm LS-03M5-C183 | 50x0.5mm LS-05M5-C183 | 100x0.5mm LS-10M5-C183 | 150x0.5mm LS-15M5-C183 |
| 30x0.3mm LS-03M3-C183 | 50x0.3mm LS-05M3-C183 | 100x0.3mm LS-10M3-C183 | |
| HAISIL HL C18 5µm 30x1.0mm LS-0301-C185 | 1.0mm - 0.5mm - 0.3mm I.D. 50x1.0mm LS-0501-C185 | 100x1.0mm LS-1001-C185 | 150x1.0mm LS-1501-C185 250x1.0mm LS-2501-C185 |
| 30x0.5mm LS-03M5-C185 | 50x0.5mm LS-05M5-C185 | 100x0.5mm LS-10M5-C185 | 150x0.5mm LS-15M5-C185 |
| 30x0.3mm LS-03M3-C185 | 50x0.3mm LS-05M3-C185 | 100x0.3mm LS-10M3-C185 | 150x0.3mm LS-15M3-C185 |

Analytical Columns - Stainless Steel

| | | | | |
|--|---|---------------------------|---------------------------|---------------------------|
| HAISIL HL C18 3µm 30x4.6mm LS-0346-C183 | 4.6, 3.0, and 2.1mm I.D. s.s. columns • 3µm SERIES 50x4.6mm LS-0546-C183 | 100x4.6mm LS-1046-C183 | 150x4.6mm LS-1546-C183 | 250x4.6mm LS-2546-C183 |
| 30x3.0mm LS-0330-C183 | 50x3.0mm LS-0530-C183 | 100x3.0mm LS-1030-C183 | 150x3.0mm LS-1530-C183 | 250x3.0mm LS-2530-C183 |
| 30x2.1mm LS-0321-C183 | 50x2.1mm LS-0521-C183 | 100x2.1mm LS-1021-C183 | 150x2.1mm LS-1521-C183 | 250x2.1mm LS-2521-C183 |
| HAISIL HL C18 5µm 30x4.6mm LS-0346-C185 | 4.6, 3.0, and 2.1mm I.D. s.s. columns 50x4.6mm LS-0546-C185 | 100x4.6mm LS-1046-C185 | 150x4.6mm LS-1546-C185 | 250x4.6mm LS-2546-C185 |
| 30x3.0mm LS-0330-C185 | 50x3.0mm LS-0530-C185 | 100x3.0mm LS-1030-C185 | 150x3.0mm LS-1530-C185 | 250x3.0mm LS-2530-C185 |
| 30x2.1mm LS-0321-C185 | 50x2.1mm LS-0521-C185 | 100x2.1mm LS-1021-C185 | 150x2.1mm LS-1521-C185 | 250x2.1mm LS-2521-C185 |

Semi-Prep and Prep Columns

| | | | |
|---|--|--------------------------|--------------------------|
| HAISIL HL C18 5µm 50x10mm LS-0510-C185 | 10mm & 20mm I.D. Stainless Steel Semi-Prep and Prep Columns 100x10mm LS-1010-C185 | 150x10mm LS-1510-C185 | 250x10mm LS-2510-C185 |
| 50x20mm LS-0520-C185 | 100x20mm LS-1020-C185 | 150x20mm LS-1520-C185 | 250x20mm LS-2520-C185 |

HAICART - Stainless Steel Analytical Cartridge Columns

| | | |
|---|---|----------------------------|
| HAISIL HL C18 3µm 40x4.6mm LF-0446-C1835 | 4.6 and 3.2mm I.D. s.s. Analytical Cartridges 50x4.6mm LF-0546-C1835 | 100x4.6mm LF-1046-C1835 |
| 40x3.2mm LF-0432-C1835 | 50x3.2mm LF-0532-C1835 | 100x3.2mm LF-1032-C1835 |
| HAISIL HL C18 5µm 40x4.6mm LF-0446-C1855 | 4.6 and 3.2mm I.D. s.s. Analytical Cartridges 50x4.6mm LF-0546-C1855 | 100x4.6mm LF-1046-C1855 |
| 40x3.2mm LF-0432-C1855 | 50x3.2mm LF-0532-C1855 | 100x3.2mm LF-1032-C1855 |

HAIPEEK - PEEK Analytical Cartridge Columns

| | |
|---|---|
| HAISIL HL C18 5µm 40x2.1mm LK-0421-C1855 | 2.1mm I.D. PEEK Analytical Cartridges 50x2.1mm LK-0521-C1855 |
|---|---|

HAISpeed10 - 10mm I.D. Stainless Steel Cartridge Columns

| | | |
|---|---|---------------------------|
| HAISIL 100 C18 5µm 30x10mm LF-0310-C1855 | 10mm I.D. s.s. HAISpeed Cartridges 50x10mm LF-0510-C1855 | 100x10mm LF-1010-C1855 |
|---|---|---------------------------|

HAICART - Stainless Steel Guard Cartridges

| | |
|---|--|
| HAISIL HL C18 5µm 20x3.2mm L1185 | 3.2mm I.D. s.s. Guard Cartridges 5/pkg |
|---|--|

HAIPEEK - PEEK Guard Cartridges

| | |
|---|--|
| HAISIL HL C18 5µm 20x2.1mm LK-0221-C1855 | 2.1mm I.D. PEEK Guard Cartridges 5/pkg |
|---|--|

HK-GUARD, HK-HOLD, 10-HOLD and 20-HOLD holders required for these cartridge columns.

HAICART (stainless steel) and HAIPEEK (PEEK) guard cartridges are compatible with Higgins Analytical HAIPEEK Guard Holders and the PE Brownlee NewGuard™ Holder.



We Violate the 80:20 Rule

This catalog contains hundreds of parts and it would probably be no surprise to you if we pointed out that only about 20% of them are manufactured 80% of the time. But what you would not know is that another 20% of the products we manufacture are not even listed in this catalog!

We stock tubing with a wide variety of internal diameters, and since we machine the columns and cartridges ourselves, custom length and I.D. columns are almost as easy for us to provide as are the standard sizes listed in this catalog. Since our part numbering system has an easy to understand pattern, customers routinely compose and order custom configurations.

Easy to Understand Part Numbers

Except for HAICART Guard Cartridges, all Higgins Analytical HPLC column product part numbers are based on a 2-4-4 character pattern. While we will not manufacture every combination and permutation devisable with this scheme, this page will serve as a guide to assist you in defining a product that you believe would better address your needs than one of the hundreds of formats we routinely manufacture.

The two character prefix indicates *sorbent and hardware type*. Standard configurations are **highlighted**.

Prefix Character 1 (Sorbent)

X-XXXX-XXXX
C = CLIPEUS
H = HAISIL 100 or HAISIL 300
K = Kromasil
L = HAISIL HL
T = TARGA

Prefix Character 2 (Hardware)

X-XXXX-XXXX
S = Stainless steel HPLC Column
P = PEEK HPLC column
F = Stainless steel cartridge column
K = PEEK cartridge column
N = Nano Scale column (150µm)

The four center characters indicate the column or cartridge *length (cm) and internal diameter (mm)*.

Center Characters 1 and 2 (Length)

XX-**■**XX-XXX
03 = 3cm **04** = 4cm
05 = 5cm **07** = 7.5cm
10 = 10cm **12** = 12.5cm
15 = 15cm **20** = 20cm
22 = 22cm **25** = 25cm
30 = 30cm **50** = 50cm

Center Characters 3 and 4 (I.D.)

XX-XX-**■**-XXXX
15 = 150µm **M3** = 300µm
M5 = 500µm **M8** = 800µm
01 = 1.0mm **21** = 2.1mm
30 = 3.0mm **32** = 3.2mm
40 = 4.0mm **46** = 4.6mm
10 = 10mm **20** = 20mm

The four character suffix indicates *sorbent chemistry and particle size*.

Suffix Characters 1 to 3 (Phase)

XX-XXXX-**■**■**■**X
C04 = Butyl or C4
C08 = Octyl or C8
C18 = ODS or C18
CNP = Cyano or Nitrile
M08 = HAISIL 100 C8
M18 = HAISIL 100 C18
NH2 = Amino
PHN = Phenyl
SIL = Silica Gel
W04 = 300Å C4
W08 = 300Å C8
W18 = 300Å C18

Suffix Character 4 (Particle Size)

XX-XXXX-XXX**■**
1 = 10µm
2 = 10 - 15µm
3 = 3 or 3.5µm
5 = 4.5 or 5µm
7 = 15 - 20µm

Custom HPLC Columns

Let us or The Nest Group, Inc. know if you have particular needs or are interested in formats or chemistries not listed in this catalog. Higgins Analytical is continuously developing new products and would be interested in discussing your individual requirements.

We are also able to pack your own sorbents into analytical or semiprep columns enabling you to conduct selectivity tests and separation optimization work before you commit your sample to very large scale columns packed with the same material.

Higgins is grateful to the following individuals for permission to share their data in this catalog:

Jane Cooper, Lilly Research, Erl Wood Manor, Windlesham, Surrey UK
In Vivo Microdialysis Samples from Rat Hypothalamus. Page 27

Larry David, Oregon Health Sciences University, School of Dentistry, Portland, OR
Human Ocular Lens Protein (Beta A1 Crystallin and Gamma S Crystallin) Analysis by LC/MS. Page 29

Chris Gong and Chulani Karunatilake, Genentech, Inc., South San Francisco, CA
Fast Peptide map of rhGH on a 5cm column. Page 17

Elizabeth Harris, Emisphere Technologies, Inc., Hawthorne, NY
Fast Analysis a Drug Delivery System. Page 17

David Hawke, Perseptive Biosystems, Western Technical Center, South San Francisco, CA
Fast Tryptic Map of Cytochrome-C. Page 17

Ted Holman, University of California, Santa Cruz, CA
Large Competitive Kinetic Isotope Effects in Human 15-Lipoxygenase Catalysis Measured by a Novel HPLC Method. Page 11

David Isom, Analytical Sales and Service, Pompton Plains, NJ
Fat-Soluble Vitamin Assay. Page 27
Antibacterials. Page 27
Antihypertensives. Page 29

Krishna Kalghatgi, NeoGenesis, Cambridge, MA
RPC of Basic Compounds in Combinatorial Mixtures. Page 23

Kamlesh Patel, University of North Carolina, Department of Chemistry, Charlottesville, VA
Analysis of Basic Peptides and Peptide Mapping without TFA. Page 27

Mark Ross, Argonex, Inc., Charlottesville, VA
Micropreparative Chromatography and Reanalysis of Peptides from Tumor Cells. Page 17

Steve Sharp, Roche Products, Welwyn Garden City, UK
LC/MS of Serum Samples. Page 23

Lorne Vandermark, Pharmco, Titusville, FL
Analysis of Cat's Claw Extract. Page 11

Expert and Responsive Technical Support

As a Higgins Analytical Customer seeking technical support or product information, you will eliminate long waits and expensive phone calls, and you will never be transferred from one person to another only to end up in someone's phone mail! By simply faxing (1-508-485-5736) or e-mailing (sales@nestgrp.com) your question to The Nest Group's **Technical Support**, you will receive a prompt written response. If we don't know the answer, they will tell you so – but, that doesn't happen very often. Additional up-to-date product and application information can be found by pointing your browser at <http://www.higanalyt.com> or <http://www.nestgrp.com>

Easy Ordering and Rapid Delivery

Our worldwide network of qualified distributors can provide expert support and prompt delivery from their local inventory. Our catalog-listed items are generally shipped from the factory within a day of receiving the order. In the event that we have not provided you with a near by distributor, we can ship an order to you directly from the factory by a variety of carriers.

In order to further simplify the process for you and your purchasing department, The Nest Group, one of our many distributors accepts credit card orders.



Payment terms for all other orders are net 30 days from date of invoice.

Product Availability

Higgins Analytical products are available worldwide through a network of responsive distributors. These organizations can provide qualified technical support and prompt product delivery. The Nest Group, Inc. 508-481-6223 or 800-347-6378 is an excellent distributor (U.S & Canada), that offers excellent technical support as well as inventory of our products. E-mail them at info@nestgrp.com or use www.nestgrp.com



HIGGINS ANALYTICAL PRODUCTS MAY BE PURCHASED AND ARE SOLD ONLY ON THE FOLLOWING WARRANTY TERMS AND CONDITIONS. ADDITIONAL OR DIFFERENT TERMS, WHETHER IN AN ORDER, ACKNOWLEDGMENT, INVOICE OR OTHER DOCUMENT, SHALL NOT BECOME PART OF OR VARY THE FOLLOWING TERMS UNLESS AGREED TO IN WRITING BY HIGGINS ANALYTICAL.

LIMITED WARRANTY

Higgins Analytical products are manufactured and quality controlled to the highest industry standards, and Higgins Analytical warrants that the products, when properly applied in accordance with Higgins Analytical's standards therefore, will perform for a period of thirty (30) days after delivery substantially as described in Higgins Analytical's then current specifications for the product. If a customer believes a product does not comply with such warranty, the customer shall, within the warranty period, report the purported defect to Higgins Analytical and cooperate fully with Higgins Analytical in determining the conditions and cause of any purported defect and, thereby, obtain a returned goods authorization from Higgins Analytical or the place of purchase. If Higgins Analytical determines the alleged defect occurred as a result of misuse, neglect, improper installation, repair, alteration, application or accident, rapid depressurization, removal of column end fittings, unusual physical or electrical stress or improper handling procedure, the warranty shall be void and ineffective.

EXPRESS LIMITATIONS

HIGGINS ANALYTICAL PRODUCTS ARE MANUFACTURED FOR USE IN RESEARCH IN CHEMICAL MANUFACTURING LABORATORIES ONLY AND ARE NOT INTENDED FOR USE IN CLINICAL OR DIAGNOSTIC APPLICATIONS. THE HAISPEED 10 AND HAISPEED 20 CARTRIDGE HOLDERS ARE RATED FOR USE UP TO 3,000 PSI (200BAR) WITH FLUIDS THAT ARE LIQUID AT STP (STANDARD TEMPERATURE AND PRESSURE) ONLY. SERIOUS BODILY INJURY OR DEATH MAY RESULT IF A HAISPEED HOLDER BROKE WHILE WORKING WITH SUPERCRITICAL FLUIDS.

DISCLAIMER

EXCEPT AS EXPRESSLY PROVIDED, ALL WARRANTIES, CONDITIONS, REPRESENTATIONS, INDEMNITIES AND GUARANTEES, WHETHER EXPRESS OR IMPLIED, ARISING BY LAW, CUSTOM, PRIOR ORAL OR WRITTEN STATEMENTS BY HIGGINS ANALYTICAL OR OTHERWISE (INCLUDING, BUT NOT LIMITED TO, ANY WARRANTY FOR MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE) ARE OVERRIDDEN, EXCLUDED AND DISCLAIMED.

EXCLUSIVE REMEDY

In the event a customer establishes a breach of the above warranty, customer's exclusive remedy against Higgins Analytical, and Higgins Analytical's sole liability, is, at its option, the replacement of the defective product or the refund of the purchase price therefor.

NO CONSEQUENTIAL DAMAGES

HIGGINS ANALYTICAL SHALL NOT BE RESPONSIBLE FOR ANY CONSEQUENTIAL, INDIRECT, SPECIAL, PUNITIVE OR INCIDENTAL DAMAGES, WHETHER FORESEEABLE OR UNFORESEEABLE, INCLUDING, BUT NOT LIMITED TO, CLAIMS FOR LOSS OF GOODWILL, PROFITS, USE OF MONEY OR USE OF PRODUCTS, STOPPAGE OF OTHER WORK OR IMPAIRMENT OF OTHER ASSETS, ARISING OUT OF BREACH OF EXPRESS OR IMPLIED WARRANTY, BREACH OF CONTRACT, MISREPRESENTATION, NEGLIGENCE, STRICT LIABILITY IN TORT OR OTHERWISE, EXCEPT ONLY IN THE CASE OF PERSONAL INJURY WHERE AND TO THE EXTENT THAT APPLICABLE LAW REQUIRES SUCH LIABILITY.

PATENTS AND TRADEMARKS

Kromasil is a trademark of Eka Nobel. NewGuard and MPLC are trademarks of Perkin-Elmer. PICOTAG is a trademark of Waters. HAISIL, HAICART, HAIPEEK, HAIFILTER, TARGA®, CLIPEUS, HAISpeed, and HAIGUARD are trademarks of Higgins Analytical, Inc. Guard-Disc® is a trademark of Transgenomics, Inc. HAIGUARD and Guard-Disc® are covered by U.S. Patent 5,338,448 and other patents pending.