

Příloha č. 1 - Technická specifikace

UTB – Vysokoúčinný kapalinový chromatograf s refraktometrickou detekcí

IDENTIFIKAČNÍ ÚDAJE ZADAVATELE

Obchodní název:	Univerzita Tomáše Bati ve Zlíně
Sídlo:	nám. T. G. Masaryka 5555, 760 01 Zlín
IČO:	70883521
Rektor:	prof. Ing. Petr Sáha, CSc.

Předmět veřejné zakázky:

Předmětem veřejné zakázky je dodávka **vysokoúčinného kapalinového chromatografu s refraktometrickou detekcí** pro potřeby Centra polymerních systémů Univerzity Tomáše Bati ve Zlíně.

Část přístroje	Specifikace předmětu veřejné zakázky	Nabídka splňuje / nesplňuje
Součástí dodávky je čerpadlo		Ano , P/N 186269505: HPLC systém Alliance e2695 separační modul, obsahující kvarternární čerpadlo, vakuový degaser a autosampler
	kvarternární gradientové čerpadlo	Ano , kvarternární gradientové čerpadlo, výběr ze čtyř solventů
	tlak minimálně 5000 psi	Ano , max. tlak 5 000 psi, programovatelný horní a dolní tlakový limit
	rozsah průtoků 0,01 - 10,00 ml/min	Ano , 0,01 – 10,00 ml/min, nastavitelný po 0,001ml/min přidavcích
	aktivní oplach pístů	Ano , integrovaný, aktivní, programovatelný
	lineární, konvexní a konkávní průběh gradientu	Ano , celkem 11 gradientových křivek (lineární, konvexní, konkávní a skokový průběh gradientu)
Součástí dodávky je autosampler:		Ano , součást separačního modulu Alliance e2695
	kapacita minimálně 120 vialek o objemu 2 ml	Ano , kapacita 120 vialek o objemu 2 ml, umístěných v pěti karuselech po 24 vialkách



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Součástí dodávky je vakuový degaser	rozsah nástřiku 0,1 - 2000 µl	Ano , 0,1 – 2000,0 µl
	aktivní oplach jehly	Ano , programovatelný, aktivní, hnaný malým čerpadlem
	nízký přenos vzorku ($\leq 0,003$ % pro kofein)	Ano , $\leq 0,0025$ % pro kofein
		Ano , součást separačního modulu Alliance e2695
	4 komůrky, každá o maximálním objemu 500 µl.	Ano , 4 komůrky, každá o objemu < 500 µl.
Součástí dodávky je kolonový termostat :		Ano , P/N WAT038040, Kolonový termostat do + 150°C
	okolní teplota až +65°C	Ano , okolní teplota až +150°C
	prostor pro zapojení 3 kolon o délce 30 cm	Ano , prostor pro 4 kolony o délce 30 cm.
Součástí dodávky je RI (Refractive Index) detektor :		Ano , P/N 186241401, RI detektor Waters 2414
	měřicí rozsah alespoň 5,0 x 10 ⁻⁴ RIU až 6,5 x 10 ⁻⁹ RIU	Ano , měřicí rozsah 5,0 x 10 ⁻⁴ RIU až 7,0 x 10 ⁻⁹ RIU
	drift maximálně do 2,5 x 10 ⁻⁷ RIU/hod	Ano , drift 2,0 x 10 ⁻⁷ RIU/hod
	minimální průtok 0,1 až 10 ml/min	Ano , pro průtoky 0,1 až 10,0 ml/min
	teplotní kontrola od 35 °C do 50 °C	Ano , teplotní kontrola od 30°C do 55°C
	objem cely alespoň 10 µl	Ano , cely o objemu 10 µl
Součástí dodávky je software		Ano , P/N 176002203, Software Empower 3 (Personal Single System)
	musí řídit celý systém a zpracovávat data	Ano , řízení celého systému včetně zpracování dat
	vestavěná relační databáze s pokročilými možnostmi zpracování dat, vysokým výkonem a snadnou škálovatelností	Ano , vestavěná relační databáze ORACLE s pokročilými možnostmi zpracování dat, vysokým výkonem a snadnou škálovatelností

	musí umět zpracovávat GPC/SEC data	Ano , P/N 667003977, Empower 3 Personal GPC/SEC doplněk pro GPC/SEC výpočty
Součástí dodávky je samostatný počítač a monitor		Ano , P/N ELC005412, PC Dell Optiplex 7060 a P/N ELC005411, Dell Monitor 22"
	Tyto samostatné součásti musí zajistit bezvadné fungování předmětu veřejné zakázky	Ano , konfigurace: Dell OptiPlex 7060 Tower - Intel Core i5-8500 (6 Cores/9MB/6T/up to 4.1GHz/65W) - RAM 8 GB (2666MHz, DDR4) - HD 500 GB (7200RPM) - 8x DVD+/-RW 9.5 mm optical disk drive - 2x síťová karta Gigabit Ethernet PCI-E - klávesnice CZ, myš Dell Optical USB - MS Windows 10 Pro (English) 64 bit - záruka Dell minimálně 3 roky NBD On-site Dell Monitor 22" P2217H 54,6cm (21.5") Black je plně dostačující
Celý systém musí obsahovat		
	vestavěnou klávesnici a displej,	Ano , separační modul Alliance e2695 obsahuje klávesnici a displej, možnost ovládání a pro diagnostiku přístroje bez PC RI detektor W2414 má také klávesnici a displej
	mrtvý objem systému < 1300 µl	Ano , mrtvý objem systému ≤ 1 145 µl
Další požadavky	Dodávka musí být plně kompatibilní se stávajícími detektory RI W2414 a ELSD W2424 od výrobce Waters	Ano , detektory RI W2414 a ELSD W2424 jsou plně kompatibilní se všemi položkami dodávky
Požadovaný počet	1 ks	Ano , 1 kus vysokoúčinného kapalinového chromatografu s refraktometrickou detekcí

V Praze dne 16. 08. 2018

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Ing. Marek Exner
Vedoucí odštěpného závodu

e2695 Separations Module

The Waters™ e2695 Separations Module, with its integrated solvent and sample management capabilities, provides the flexibility and ruggedness needed to accommodate an enormous range of HPLC separation challenges.



SOLVENT MANAGEMENT

Number of solvents	One to four
Solvent conditioning	Vacuum degas, two operating modes, four chambers, <500 µL internal volume per chamber
Flow rate range	0.01 to 10.000 mL/min (0.050 to 5.000 mL/min typical) in 0.001 mL/min increments
Compressibility compensation	Automatic and continuous
Dwell volume (total system)	≤1,145 mL
Plunger seal wash	Integral, active, programmable
Gradient profiles	11 gradient curves (including linear, step [2], concave [4], and convex [4])
Dry prime/wet prime	Automatic front panel control, SystemPREP function for automatic solvent(s) purge
Flow ramping	Time (0.01 to 30.00 min in 0.01 min increments) to reach maximum flow rate
Maximum operating pressure	5000 psi (345 bar [0.010 to 3.000 mL/min]) programmable upper and lower limits
Composition range	0.0% to 100.0%, in 0.1% increments
Composition accuracy	±0.5% absolute, independent of backpressure (proportioning valve pair test, [degassed methanol:methanol/propylparaben, 2.0 mL/min, 254 nm])
Composition precision	≤0.15% RSD or ≤0.02 min SD, whichever is greater, based on retention time (60:40 degassed methanol/water dial-a-mix, 1.00 mL/min, six replicates, phenone mix, 254 nm)
Flow precision	≤0.075% RSD or ≤0.02 min SD, six replicates, based on retention time or volumetric measures (0.200 to 5.000 mL/min), isocratic premix
Flow accuracy	±1% or 10 µL/min, whichever is greater, 0.200 to 5.000 mL/min, (degassed methanol at 600 psi backpressure)

[INSTRUMENT SPECIFICATIONS]

SAMPLE MANAGEMENT

Number of sample vials	120 vials, configured in five carousels of 24 vials each
Number of sample injections	1 to 99 injections per sample vial
Sample delivery precision	Typically <0.5% RSD, 5 to 80 μ L (using standard 250 μ L syringe), 60:40 degassed methanol/water dial-a-mix, 1 mL/min, six replicates, phenone mix, 254 nm); Typically <0.3% RSD, 5 to 60 μ L (using 100 μ L optional syringe), 70:30 degassed methanol/water dial-a-mix, 1 mL/min, six replicates, caffeine, 273 nm
Sample carryover	Sample carryover $\leq$ 0.0025% for caffeine, under specified conditions Injection needle wash Integral, active, programmable
Injection accuracy	± 1 μ L ($\pm 2\%$) (50 μ L, N=6), sample: 100% degassed water, analytical solvent: 100% degassed methanol
Standard sample vial	2 mL
Advanced operations	Priority samples, auto additions, auto standards
Injection volume range	0.1 to 100.0 μ L, standard; 0.1 to 2000.0 μ L, with optional sample loop
Injector linearity	>0.999 coefficient of deviation (1.000 to 100.000 μ L)
Minimum sample required	10 μ L, using low volume inserts
Sample temperature control (optional)	4 to 40 $^{\circ}$ C, programmable in 1 $^{\circ}$ C increments, 60 minute time to temperature ± 2 $^{\circ}$ C accuracy ± 1 $^{\circ}$ C stability
Column heater (optional)	20 to 65 $^{\circ}$ C, in 1 $^{\circ}$ C increments (5 $^{\circ}$ C above ambient)
Column heater/cooler (optional)	Ambient minus 15 or 4 $^{\circ}$ C (whichever is greatest) up to 65 $^{\circ}$ C, in 1 $^{\circ}$ C increments

INSTRUMENT CONTROL

Communications	IEEE-488, RS-232, Ethernet
External control	Empower™ or MassLynx™ Software
Event inputs	Three, TTL or switch closure
Programmable event outputs	Six, contact closure

ELECTRICAL SPECIFICATIONS

Power requirements	950 VA (maximum)
Voltage range	100 to 240 VAC
Frequency	50 to 60 Hz

[INSTRUMENT SPECIFICATIONS]

PHYSICAL/ENVIRONMENTAL SPECIFICATIONS

Dimensions	Height: 57.1 cm (22.5 inches)
	Depth: 57.1 cm (22.5 inches)
	64.8 cm (25.5 inches) with optional sample heater/cooler
	Width: 45.7 cm (18.0 inches)
	58.4 cm (23.0 inches) with optional column heater
Weight	45.5 kg (100.0 pounds)
	59.1 kg (130.0 pounds) with optional sample heater/cooler and column heater
Primary wetted materials	316 stainless steel, ruby, sapphire, MP35N, PEEK, PPS, UHMWPE, Tefzel (ETFE), Teflon (FEP and PTFE), Teflon AF, Fluoroloy G, Fluoroloy-08R
Acoustic noise	≤65 dB(A)
Operating temperature range	4 to 40 °C
Operating humidity range	20% to 80%, non-condensing

ORDERING INFORMATION

e2695 Separations Module*	Temperature Control		Part Number
	Samples	Column(s)	
e2695 XC	Heating/Cooling	Heating/Cooling	176269502
e2695 XE	Heating/Cooling	Heating	176269503
e2695	Heating/Cooling		186269506
e2695		Heating	176269501
e2695			186269505

* Standard features include vacuum solvent degassing and active piston seal wash.

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2414 Refractive Index Detector

The Waters® 2414 Refractive Index (RI) Detector defines the standard of excellence for differential refractive index detectors. Designed to provide the highest sensitivity, stability, and reproducibility, the 2414 RI Detector is the ideal solution for the analysis and quantification of components with limited or no UV absorption, such as alcohols, sugars, saccharides, fatty acids, and polymers.



OPERATING SPECIFICATIONS¹

Refractive index range	1.00 to 1.75 RIU
Measurement range	5.0×10^{-4} RIU to 7.0×10^{-9} RIU
Linear dynamic range	$\leq 5.0\%$ over $\pm 5.0 \times 10^{-4}$ RIU
Noise ²	$\pm 1.5 \times 10^{-9}$ RIU (2 s FTC Hamming 1.0 mL/min, 100% H ₂ O) $\pm 3.0 \times 10^{-9}$ RIU 410/2410 emulation mode (1 s FTC (RC) 1.0 mL/min, 100% H ₂ O)
Drift	2.0×10^{-7} RIU/hour
Filter time constant	0.0 to 5.0 s (Hamming) 0.0 to 10.0 s (RC)
Compatible flow rate range	0.1 to 10.0 mL/min
Attenuation settings	1 to 500×10^{-6} RIU 1 to 1024 maximum in emulation mode
Temperature control	Internal oven: 30 to 55 °C (86 to 131 °F), ± 0.5 °C, settable 1 °C increments One external column heater, steel: Ambient to 150 °C (302 °F), ± 1.0 °C, settable 1 °C increments

OPTICAL COMPONENT SPECIFICATIONS

Flow cell	Fused quartz
Flow cell volume	10 μ L
Flow cell pressure limit	≤ 100 psi
Light source	LED 870 nm
Wetted materials	316 stainless steel, PTFE, PEEK, quartz

[INSTRUMENT SPECIFICATIONS]

ELECTRICAL SPECIFICATIONS

Power requirements	100 to 240 VAC
Line frequency	50 to 60 Hz
Power consumption	145 VA (nominal)
Inputs	Seven event inputs
Outputs	Three outputs (2 analog and 1 event)

PHYSICAL/ENVIRONMENTAL SPECIFICATIONS

Dimensions	Width: 34.3 cm (13.5 inches) Height: 20.8 cm (8.2 inches) Depth: 61.0 cm (24.0 inches)
Weight	16.3 kg (36.0 pounds)
Operating temperature range	15 to 40 °C (59 to 104 °F)
Operating humidity range	20% to 80%, non-condensing
Audible noise	<58 dBA

ORDERING INFORMATION

PART NUMBER

2414 Refractive Index Detector for Alliance® HPLC Systems	186241401
2414 Refractive Index Detector for ACQUITY® Arc™ Systems	176017008
Column Heating Compartment	WAT038040

1. All performance specifications are measured following a warm-up period of 2 hours with ambient $\Delta T \leq \pm 2.0$ °C/hour
2. ASTM E1303-95

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2414 RI Detector

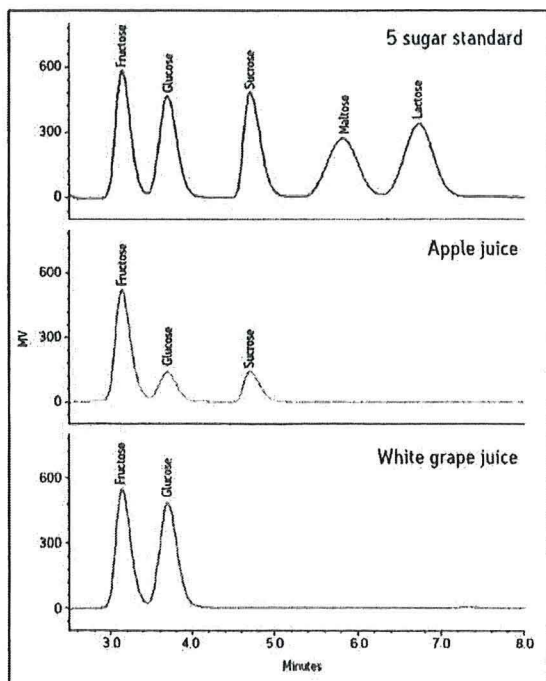
Superior stability for reproducibility and sensitivity

RELIABLE AND REPEATABLE ANALYSIS OF NON-ABSORBING COMPONENTS

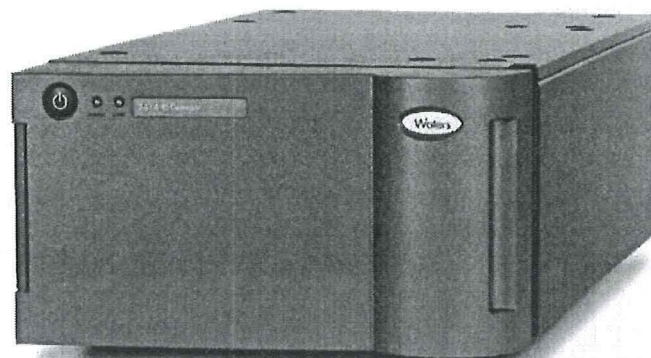
The Waters® 2414 Refractive Index (RI) Detector defines the standard of excellence for differential refractive index detectors. Designed to provide the highest sensitivity, stability, and reproducibility, the 2414 RI Detector is the ideal solution for the analysis and quantification of components with limited or no UV absorption, such as alcohols, sugars, saccharides, fatty acids, and polymers.

Quantification in quality control

Many quality control applications are challenged by the need for accurate and repeatable quantification of components that do not have a UV chromophore. The wide, repeatable measurement range offered by the 2414 RI Detector makes it an excellent choice for these QC applications.



Of the five recognized food sugars (fructose, glucose, sucrose, maltose, and lactose), the first three are the most important in fruit juice analysis. These sugars are quickly and easily analyzed on a system utilizing the 2414 RI Detector, the Alliance HPLC System, and an XBridge™ Amide XP Column.



2414 RI Detector.

Versatile for many applications

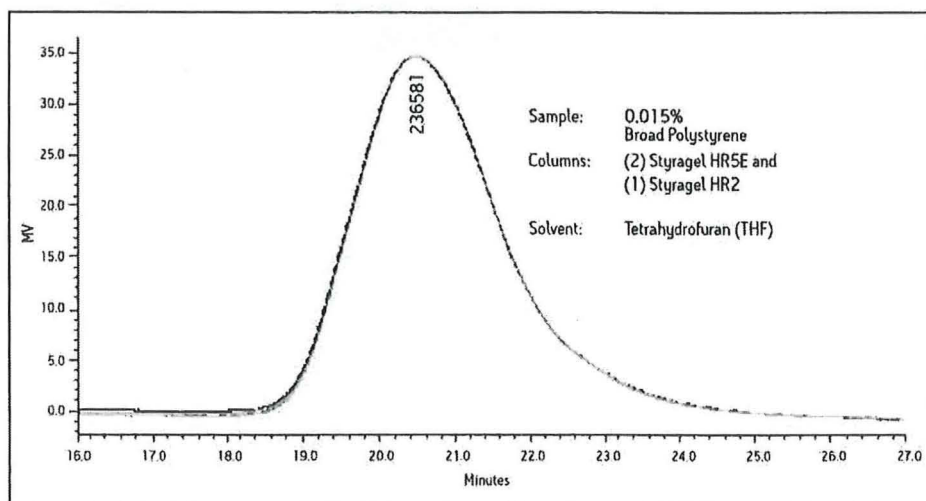
Combined with Waters Alliance® HPLC system, the 2414 RI Detector completes a total sample-centric solution for many applications, including:

- Polymer analysis
- Quality control (QC) applications
- Preparative analysis
- Analytical analysis
- Food applications

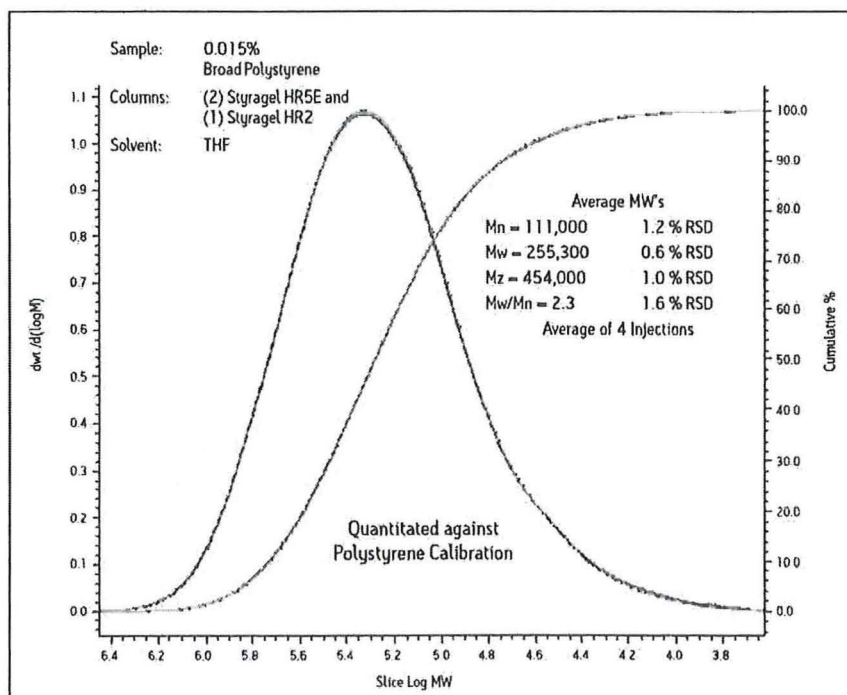
[PRODUCT SOLUTION]

Highly repeatable polymer analysis

The analysis of polymers by gel permeation chromatography (GPC) requires a system that is highly repeatable to obtain an accurate measurement of the molecular weight. The 2414 RI Detector was designed to manage these stringent requirements for the chromatographic analysis of polymers. The thermal design of the 2414 RI Detector delivers low noise and drift performance for accurate polymer measurements, even at lower concentrations. Combined with the highly repeatable solvent delivery of the Alliance HPLC System and the powerful data processing and reporting capabilities provided by the Empower® Software GPC option, this system offers the ultimate solution for accurately and reproducibly determining the molecular weight distribution of a polymer.



Temperature stability and high sensitivity in the 2414 RI Detector allow for the analysis of polymers at low concentration.

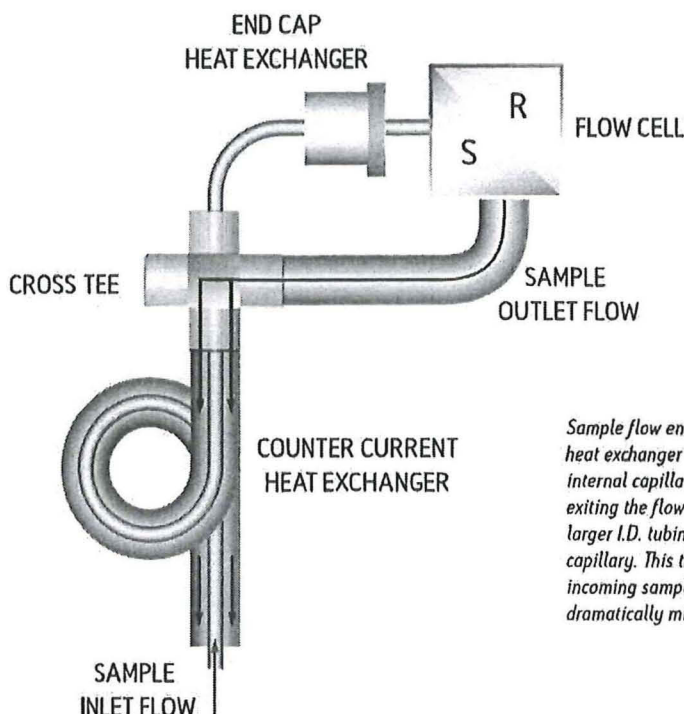


Highly repeatable molecular weight distribution measurements were achieved for this broad polystyrene sample using the 2414 RI Detector and the Alliance HPLC System.

INNOVATIVE THERMODYNAMIC MANAGEMENT

The 2414 RI Detector hosts an impressive array of innovations that contribute to temperature stability and performance reproducibility. The internal oven's direct-conduction temperature control stabilizes the detector cell in an isolated optics area. A unique polymeric insulation barrier, designed to eliminate sensitivity to environmental temperature changes, protects the optics area.

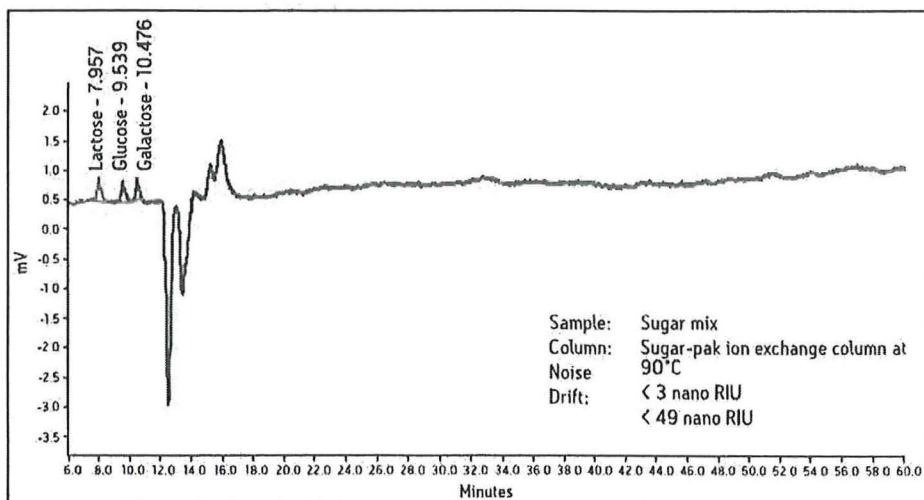
Waters' innovative counter-current heat exchanger quickly equilibrates temperature differences between the solvent stream entering and exiting the flow cell. This non-traditional heat exchanger prevents fluctuations in viscosity and refractive index, other than those changes caused by the sample itself. Reproducibility is enhanced with an optional, detector-controlled column heater, capable of stabilizing mobile phase viscosity prior to entering the detector.



The counter-current heat exchanger provides:

- Improved temperature control
- Faster warm-up times, baseline stability
- Low baseline noise and drift

Sample flow enters the counter-current heat exchanger traveling through an internal capillary into the flow cell. When exiting the flow cell, it flows through a larger I.D. tubing that surrounds the inlet capillary. This thermally equilibrates the incoming sample-flow temperature, and dramatically minimizes drift.



The thermodynamic management of the 2414 RI Detector delivers excellent baseline performance for quantification of low-level components. This 10-ng on-column sugar analysis at 90 °C was easily quantified, due to the low detector noise and drift that is consistent even when the baseline was monitored over an extended period of time.

FLEXIBLE IMPLEMENTATION

The 2414 RI Detector provides for a streamlined user experience, offering the flexibility to use it stand-alone or as part of any of Waters HPLC system solutions.

Modular or integrated solutions provide:

- Optimized for use with Alliance HPLC systems
- External output necessary to support advanced fraction collection routines
- Control of external HPLC column oven
- Full module control in Empower Software

Simplified operation for:

- Front panel control
- Auto-purge to conveniently fill the reference flow cell with fresh mobile phase
- User-accessible diagnostic functions, including automated noise and drift tests
- Ease of use with simplified optics bench alignment, so routine maintenance is not required

BE ASSURED

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*Alliance HPLC System with
2414 RI Detector.*

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TEMPERATURE CONTROL SYSTEM

Do these temperature-related issues impair your HPLC process?

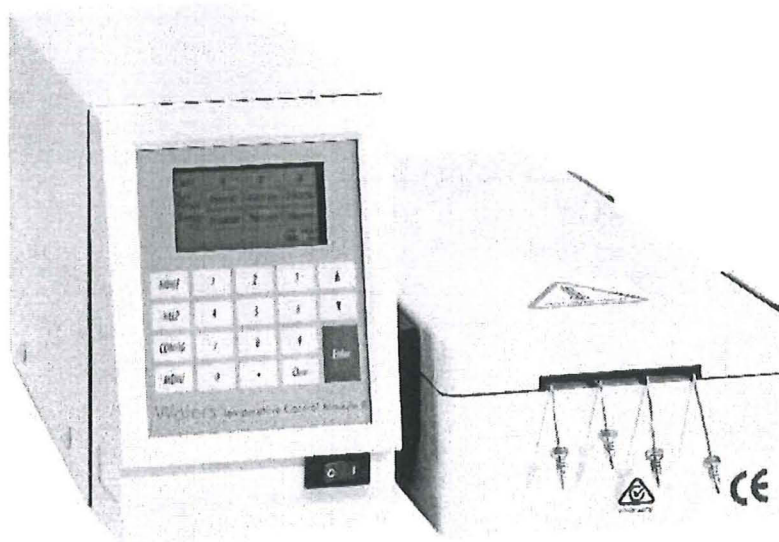
- Inaccurate and inconsistent temperature readings from system to system and lab to lab?
- Inaccurate quantitation due to system temperature fluctuations?
- Difficulty programming multiple column heaters to different set points?

Precise HPLC column temperature control for accurate quantitation and reproducibility.

The Waters® programmable Temperature Control System maintains liquid chromatography columns at consistent temperatures— from a few degrees above ambient to 150 °C.

The system consists of the easy-to-operate Temperature Control Module II and the Column Heater Module. The Column Heater Module can hold as many as four HPLC/GPC columns. The control module can independently control as many as three Column Heater Modules, each of which can be programmed to a different temperature set point.

The Waters Temperature Control System plays a critical role in GPC analyses, amino acid analysis and high-speed separations where slight variations in temperature may adversely affect accurate quantitation or reproducibility. The system can also be used in post-column reaction configurations if the post-column reaction requires elevated temperatures.



Waters Temperature Control System.

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Improved temperature accuracy, reliability and reproducibility.

The Waters Temperature Control System operates by true proportional heating. It uses the high gain response of on/off heaters to rapidly elevate temperatures to within 0.5 °C of the set point. The Temperature Control Module II maintains temperature stability to 0.1 °C with a set point feedback integration function that virtually eliminates the typical variation between set point and measured temperature. The Temperature Control Module II continuously adjusts its duty cycle to maintain set point temperature accuracy while avoiding the "over-shooting" and "under-shooting" typical of conventional temperature controllers.

Easy to operate.

The Column Heater Module can house up to four columns with lengths to 30 centimeters or one column with a Waters Ninhydrin reaction coil. Up to three columns may be used with one Waters RXN 1000 reaction coil. The Temperature Control Module II can simultaneously and independently control one, two or three Column Heater Modules. The measured temperatures of each Column Heater Module are displayed on the front panel. Temperature set points and upper/lower temperature limits for each Column Heater Module are programmed on the front panel and quickly accessed by a single keystroke. The Waters Temperature Control System can also be controlled through Empower™ or Millennium®32 software.

Ordering Information

Description

Temperature Control System, 100V-240V, 50/60 Hz

Includes one Column Heater Module and the
Temperature Control Module II (which can independently
control three Column Heater Modules)

Column Heater Module

Part Number

WAT038039

WAT038040

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