

# AF2000 HT

## High Temperature Flow FFF



System covered by national and international patents: DE:197.09.250/DE:198.08.992/US:6.109.119/US:6.192.764B1; other patents pending.

Technical specifications are subject to change without further notice.

The most powerful Technology  
for Separation of Polymers  
at High Temperatures!

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# Specifications

## Measurement Range:

Polymers:  $10^4$ - $10^9$  Da / Nanoparticles: 1 nm-10  $\mu$ m (depending on membrane and sample material)

## Channel Cartridge System:

The patent pending Postnova ceramic membrane system is a major break-through in FFF science. For HTFFF the following cartridge is offered:

- New Ceramic-Stainless Steel composite channel
- Lower Membrane cut-off:  $5 \times 10^4$  Da (polystyrene)
- Inner Volume: 0.5 -1.5 mL depending on spacer
- Inner Channel Thickness: 350  $\mu$ m
- Outer Dimensions: 335 x 60 x 40 mm

## Applicable Solvent Systems:

- Organic: TCB and other typical organic solvents
- Aqueous: Polar aqueous solvents may be used for certain applications; please contact Postnova

## Connected Detector Systems:

The same proven detection systems which are used in HTGPC can also be used in HTFFF:

- Low/Right/Multi Angle Light Scattering for MW/Rg
- Viscometric Detection for MW/Rh
- Refractive Index for Concentration
- Infrared Detection for Polyolefin Concentration
- Other Technologies: please contact Postnova

## Flow Rates / Pressure Ratings:

Detector flow from channel outlet 0.01-2.0 mL/min  
Cross Flow 0 -10 mL/min; Minimum control value is 0.005 mL/min, depending on installed syringe  
Channel is pressure rated up to 50 bar maximum

## Required Analysis Time:

Typically 10-20 min; shorter/longer times possible

## Electrical Power Requirements:

230V, 50Hz: Min-Max / 1.2 kW-3.6kW at 6.3-15,6A  
110V, 60Hz: Min-Max / 0.6 kW-1.8kW at 6.3-15,6A  
100V (Japan): Please inquire for power requirement  
All values are for basic set-up without detectors.

## PC Requirements:

Windows OS, min. 1024 MB RAM, 2 Ethernet ports

## Software System:

Unique NovaFFF software platform for complete system control (autosampler, pumps, detectors), data acquisition (detector signals, pressure, flows) and data evaluation as well as reporting functions (light scattering calculations, standard calibration).

## Maintenance Parts:

Only very little maintenance is required compared to HTGPC. Postnova uses only special long life pump seals, ceramic pistons, and check valves. The inert channel cartridge (Pat. pend.) is made by our unique new membrane material and can be regenerated many times after intensive use.

## Typical Injection Volume:

10-1.000  $\mu$ L with autosampler injection and 10-10.000  $\mu$ L with manual injection; Band broadening is not affected by injection volume because of the patented Focus technology used by Postnova.

## Injected Sample Mass:

Typically injected sample mass for given channel size is 10-100  $\mu$ g. Maximum sample mass can go up to 500  $\mu$ g, depending on sample nature/channel.



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# The AF2000 HT Series High Temperature Asym. Flow FFF

Asymmetric Flow Field-Flow Fractionation, also called AF4, is a new technology for the efficient separation and characterization of polymers and nanoparticles in a fast and gentle way. The AF4 technology was first commercialized by Postnova in 1996/1997. In 2004 Postnova introduced the AF2000 Series platform, using this unique AF4 technology in various systems for different applications. All AF2000 Series instruments are based on the same patented technology and are using the same principle channel set-up. In 2006 the newest member of this group, the High Temperature Asymmetric Flow FFF (Model AF2000 HT), was presented. The new patented ceramic membrane of the AF2000 HT marks a real break-through in FFF science. This special membrane opens a complete new field of applications which now can be targeted by FFF and overcomes the current limitations of traditionally used polymeric membranes of other systems. Inside the HTFFF this membrane technology can be used for the characterization of high molar mass polymers at elevated temperatures up to 220°C.

Because of several integrated patents, the Postnova AF2000 Series platform is the most advanced AF4 technology available on the market today, making it the benchmark for the industry and delivering the maximum performance possible. The AF2000 Series has the highest separation power, the most advanced channel technology and can be used for more applications than any other FFF device. Only a single software platform system is used for controlling the different FFF and detector systems and to acquire and evaluate the collected data. The system has a large, nearly universal separation range, from polymers to nanoparticles. It outperforms HTGPC especially in the range of high molar mass polymers, because the separation occurs based on the diffusion coefficient in the open flow channel without any stationary phase.

## UNIQUE FEATURES OF AF2000 HT

### Ceramic Membrane Channel Cartridge

The channel cartridge used in the AF2000 HT systems, is based on Postnova's new ceramic composite membrane technology (Patent pending). This membrane is inert, high temperature stable and can be regenerated many times before it needs to be replaced by a new cartridge.

### Broad Molar Mass Separation Range

HTFFF can separate polymers up to molar masses of  $10^9$  Da, which is not possible with HTGPC. The technology shows no size exclusion as in HTGPC, making HTFFF the ideal tool for the separation of large and ultra-large polymers.

### Gentle Separation Conditions

Because of the open channel geometry and the absence of any stationary phase the separation can be performed without shear forces and stress induced onto the macromolecule. Typical HTGPC problems, such as filtering, adsorption effects, shear induced chain degradation and late elution effects, are avoided by HTFFF.

### Patented Cross-Flow Control

The system has a special patented cross-flow control interated, using a unique dual syringe pump module with non-pulsing flow delivery for most precise separation conditions. The completely inert cross flow path is made of glass/teflon/stainless steel and thus allows the use of a variety of different organic solvents at high temperatures. The cross-flow is established without any time delay or hysteresis and the general rugged design avoids problems with plugging and corrosion. Furthermore, by using the syringe pump technology, a superior flow rate range can be accessed.

### Patented FOCUS Technology

The AF2000 HT incorporates the patented FOCUS technology, which is necessary in order to ensure a continuous and constant detector flow at any time. This is one reason for the high recovery, resolution and sensitivity of the AF2000HT system. Using the Focus technology also now makes it possible to successfully couple flow sensitive detectors, such as viscometers and RI detectors to HTFFF.

### NovaFFF Software Platform

Postnova offers a unique single software platform, which integrates the system control, data acquisition and evaluation of the different FFF/LS systems in one product. The software incorporates an advanced Light Scattering module for data acquisition, data evaluation and special molar mass and particles size calculations.

## APPLICATIONS OF AF2000 HT

Polyethylene : LDPE, LLDPE, HDPE, UHMWPE  
Polypropylene : Polypropylene in its different variations  
HTFFF in general, is the ideal choice for high and ultra-high molar mass polymers.

**Contact the People who Invented FFF!**