

PROCESS-SCALE CHROMATOGRAPHY

InPlace™ Column

- Closed system design
- Ideal for all media
- Variable height adaptor for axial compression
- Supports multiple packing methods
- Fully automated packing, unpacking & cleaning (optional)
- Reliable, sanitary and fast hydropneumatic inflatable sealing system
- Low mechanical shear during media transfer
- Hoist-free operation with optional Column Lifter or Maintenance in Place
- Complete documentation for regulatory submissions
- Customizable diameter up to 2.2m

Perform All Process Operations in a Self-Contained System to Save Buffers and Time

VERDOT Ips² InPlace process-scale chromatography columns are designed for industrial applications and allow contained filling, packing, unpacking, and cleaning in place. The columns have a sanitary design, variable height adaptor, inflatable seal, and special low-shear valves for safe slurry transfer.

VERDOT Ips² InPlace columns have been designed so that the packing, unpacking, and cleaning-in-place features do not interfere with the bed support, distribution system, and column tube, thus allowing optimum performance during any operation.

These columns are directly scalable and retain the same general design from pilot to manufacturing scale. For instance, slurry valves can be added or removed to correlate with column diameter so that the efficiency of packing and unpacking in place is kept across the entire range of dimensions.

Column packing, unpacking and cleaning can be fully automated with the optional Advanced Control Console or Packing Station.

VERDOT Ips² InPlace columns are available in many standard sizes and columns can be built in any tube height up to 1,400 mm or any diameter up to 2 m. The scale and scope of a project will seldom pose a constraint.

VERDOT Ips² InPlace columns are available with glass, stainless steel, or acrylic column tubes.

An All-In-Place System

The VERDOT Ips² InPlace column is designed to be operated with a range of systems and accessories to enable:

- Cleaning in place of all wetted surfaces before column packing or unpacking
- Even distribution of the slurry over the column diameter during transfer
- Complete slurry transfer in syringe mode using the motorized adaptor
- Self degassing before packing
- Reslurrying & unpacking in place with less than 2.5CV of buffer
- Cleaning in place of the column
- Maintenance in place using the Column Lifter or optional Maintenance in place



VERDOT Ips² InPlace column





**The VERDOT Ips² Column Lifter
& InPlace column with stainless steel tube**

General Handling

Media transfer into the column can be achieved via syringe mode or external pump.

The low-shear valves are specially designed to minimize damage to chromatography media during transfer. The adaptor being free of retention self degas by just deflating the inflatable seal. The column is then axially compressed, flow packed, or both, for optimal bed packing. The slurry valves can be rinsed while the column is packed to prepare for unpacking.

Before the unpacking operation begins, the bed is reslurried in the upflow/downflow mode or by air sparging, while the piston is raised to its highest position. The slurry is then pumped out through the slurry valves, and when it is unloaded completely, the cleaning jets can be used to rinse the column. The powerful jet and column tilting system help to ensure that no medium or residue remains on any contact surface and help to sanitize the column with less than 2.5 CV.

Specifications*

Nominal internal diameter, mm**	Actual internal diameter, mm	Motorization available	Maximum pressure at 30°C, bar		
			Calibrated borosilicate glass	Stainless steel 316L***	Acrylic***
180	180 ± 2	Yes	5.2	6.0	6.0
200	200 ± 2	Yes	4.7	6.0	6.0
250	250 ± 2	Yes	3.8	6.0	6.0
300	296 ± 2	Yes	3.6	6.0	6.0
350	350 ± 2	Yes	—	6.0	6.0
400	400 ± 2	Yes	—	6.0	6.0
450	446 ± 2	Yes	2.4	6.0	6.0
500	500 ± 2	Yes	—	6.0	6.0
600	596.5 ± 2	Yes	—	6.0	6.0
700	700 ± 2	Yes	—	3.0	3.0
800	800 ± 2	Yes	—	3.0	3.0
1,000	1,000 ± 2	Yes	—	3.0	3.0
1,200	1,200 ± 2	Yes	—	3.0	3.0
1,300	1,300 ± 2	Yes	—	3.0	3.0
1,400	1,400 ± 2	Yes	—	3.0	3.0

* Standard tube heights available: 600 and 900 mm.

** Columns with internal diameters >1,400 mm are available on request.

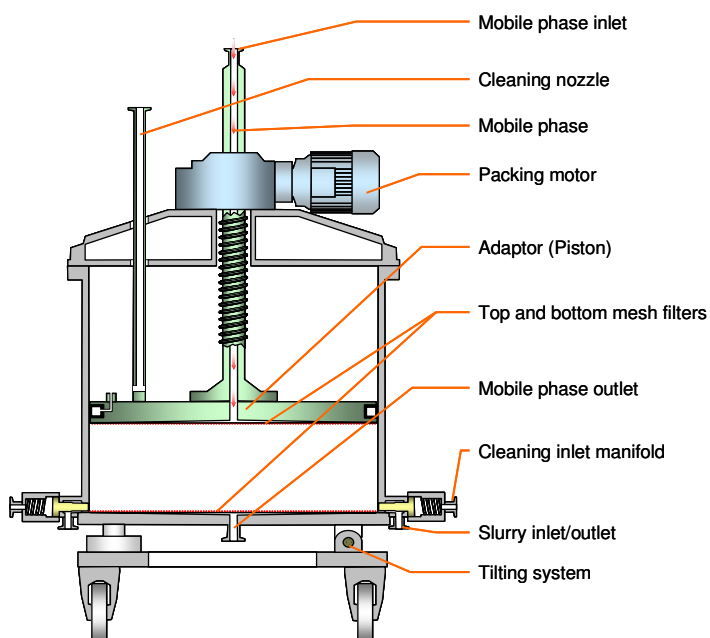
*** Higher pressure rating can be quoted on request.

— Not available.

Variable Height Adaptor and Optional Packing Motor

VERDOT Ips² InPlace columns use a variable height adaptor with an adjustable central screw mechanism. This design fits any column diameter from pilot to manufacturing scale. The adaptor allows either axial compression or flow packing, or a combination of both, while the central screw mechanism allows simple yet precise adjustment of the bed height.

VERDOT Ips² offers optional packing motors for all column diameters. A motor is strongly recommended for column diameters of ≥ 296 mm and is standard for columns $> 1,000$ mm. The use of a VERDOT Ips² packing motor allows automatic movement (upward and downward) of the adaptor and controllable speed axial compression packing, which makes packing reproducible, easier and faster.



Schematic drawing of VERDOT Ips² InPlace column

Flow Distribution System

The adaptor and bottom endpiece of VERDOT Ips² InPlace columns comprise a unique flow distribution system that enhances packing and operational performance.

The standard filter is stainless steel with 20 μ m porosity for uniform flow and free of product retention. The distributor plate directs the flow across the filter quickly and evenly. This combination of distributor plate and filter ensures optimal, uniform flow distribution across the bed and through the column at any flow rate.

Inflatable Seal

The design of the VERDOT Ips² InPlace adaptor seal provides added security against leakage and inefficient packing by ensuring uniform pressure throughout the seal. All columns are equipped with an inflatable seal and hydropneumatic pump. The inflatable seal is filled with liquid (NaOH or EtOH) and can be quickly inflated/deflated by using compressed air. Once inflated, the seal can be locked and isolated to permit unlimited storage of a packed column.

Regulatory Support and Quality Assurance

VERDOT Ips²'s manufacturing procedures mandate full documentation of each step and every component in compliance with U.S. and European regulations. The original documentation and one electronic copy are included with each column. VERDOT Ips² maintains controlled copies. InPlace chromatography columns are manufactured in compliance with engineering standards for pressure vessels, and each column comes with CE certification. The VERDOT Ips² manufacturing facility is certified according to ISO 9001:2008 standards.

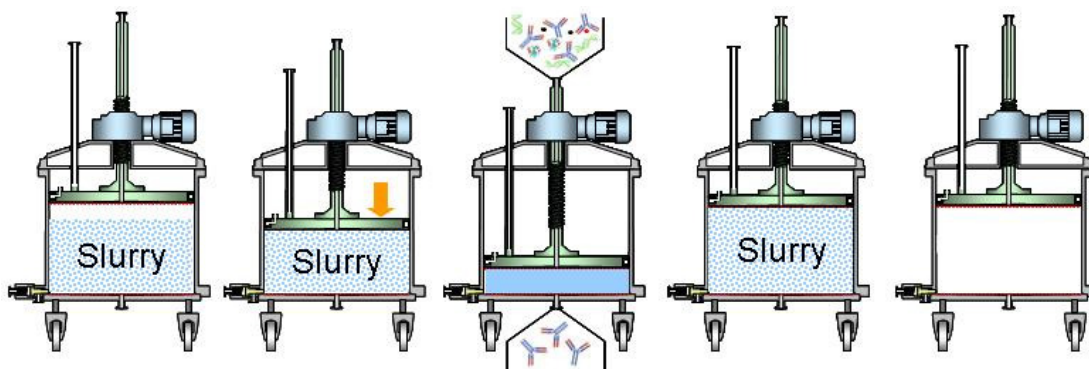
Manufacturing files for each project include:

- Engineering drawings
- Material traceability
- Weld report and welder qualifications
- Cleaning, electropolishing, and passivation certificates
- User manual and maintenance instructions
- Spare parts list
- Documentation for equipment from other vendors
- Factory acceptance test (FAT)

VERDOT Ips² systems & accessories

A range of systems & accessories are available for column operation, each providing variable levels of automation:

1. Level 1: The **Basic Control Console** - controls packing motor speed. The Transfer & Cleaning Device (TCD) both cleans and transfers the slurry in/out of the column. All controls are manual.
2. Level 2: The **Advanced Control Console** - controls the packing motor speed/position and column pressure. Recipes/methods can be generated for automated packing and unpacking operations. The Transfer & Cleaning Device (TCD) both cleans and transfers the slurry in/out of the column. All controls are manual.
3. Level 3: The **Packing station** - contains functional controls for automated slurry transfer, packing, unpacking and cleaning. Ideal for use in dedicated "packing suites".
4. Level 4: The **All-in-one** - all functionality as Level 3 + complete automation of the purification process. Ideal for operations with limited space requirements.



Systems & Accessories	Slurry Transfer	Packing	Purification	Resuspension	Unpacking
All-in-One system	Automatic (syringe & pump mode)	Automatic (axial compression & flow packing)	Automatic	Automatic	Automatic
Packing Station			(Not included)	Manual	Manual
Advanced Control Console + Transfer & Cleaning Device	Automatic for syringe mode Manual for pump mode	Automatic (axial compression)	(Not included)	Manual	Manual
Basic Control Console + Transfer & Cleaning Device	Manual	Manual		Manual	Manual