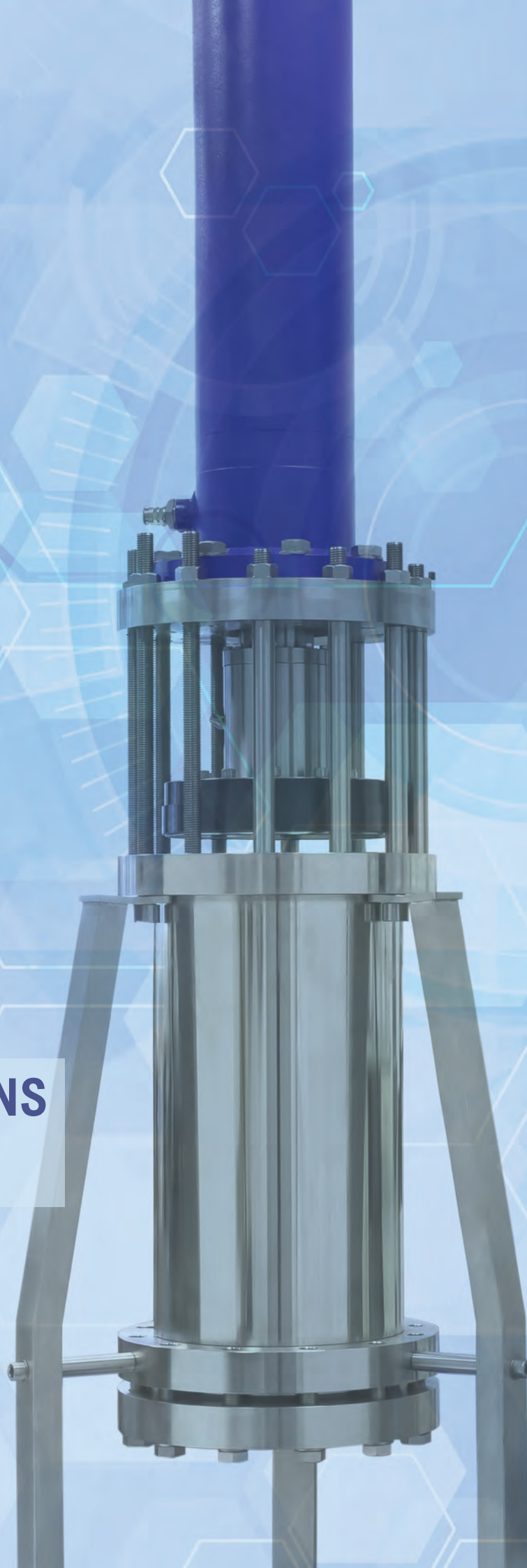




# PREPARATIVE COLUMNS

## PRODUCT CATALOG



## PRODUCT GROUPS

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# COLUMNS FOR PREPARATIVE CHROMATOGRAPHY

## separchrom<sup>PC01</sup>

### HPLC COLUMNS FOR PREP CHROMATOGRAPHY

#### High performance columns with axial compression



**Separchrom PC01** columns meet the highest requirements of preparative liquid chromatography. They are designed to be used in axial compression mode with a moving input piston. In their original design, they are equipped with identical pistons on both input and output (biaxial compression is an option). In a Separchrom PC FE modification, they have a fixed end plate on the output instead of a piston. Pistons and plates are equipped with frits. A liquid distributing system is installed under each frit. The design guarantees perfect piston flow and high efficiency - even at high injection volume, and the simple accessibility of frits for cleaning. Columns can be packed by the dynamic slurry method, by sedimentation, or by sorbent in a dry state.



**Separchrom PC01** columns are made of stainless steel AISI 316L (tube inner surface is polished to reach  $Ra < 0.3 \mu\text{m}$ ) with stain-less steel pistons and UHMWPE (PTFE on the request) sealing rings. The stroke of the main piston is proportional to the hydraulic cylinder used or the length of the flange bolts. The pistons are sectional. The frit (sintered mesh disc  $3 \mu\text{m}$  pore size, 5 mm thickness) with the frit ring can be removed. The output plate in the FE version is made of UHMWPE, and the frit is fixed with a simple frit ring. Column flanges are not welded, but they are screwed onto the column tube. No temperature increases during their manufacture means there are no changes in their steel properties. The column stand, made of stainless-steel profiles, is included for columns over 100 mm I.D. Hydraulic cylinders fitted onto the upper flange are offered with manual oil pumps as well as with fully automated electric motor-driven devices for column packing/unpacking procedures.

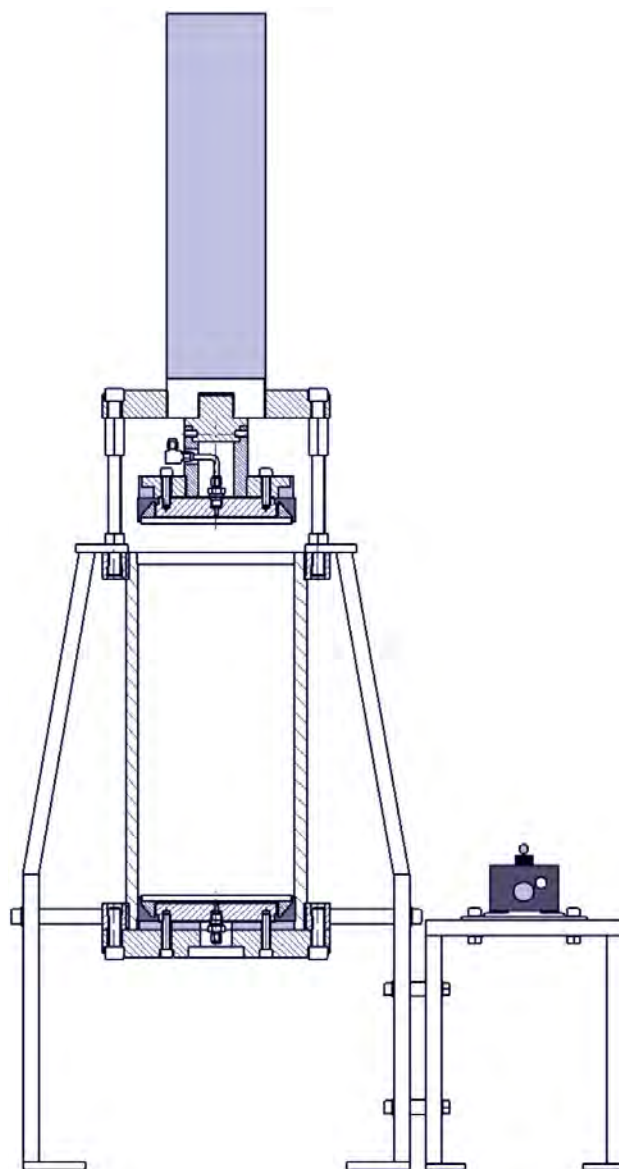
**Separchrom PC01** The columns are complemented by a broad range of accessories, such as filling adapters, slurry mixing vessels, slurry transporting pumps, etc.

#### Columns for laboratory applications

Type of column	I.D. mm	Length mm	Pressure bar	Note
SEPARCHROM PC01 25/50	25	50	200	Delivered without legs
SEPARCHROM PC01 25/100	25	100	200	Delivered without legs
SEPARCHROM PC01 25/250	25	250	200	Delivered without legs
SEPARCHROM PC01 50/50	50	50	200	Delivered without legs
SEPARCHROM PC01 50/100	50	100	200	
SEPARCHROM PC01 50/250	50	250	200	
SEPARCHROM PC01 50/500	50	500	200	
SEPARCHROM PC01 100/100	100	100	150	
SEPARCHROM PC01 100/250	100	250	150	
SEPARCHROM PC01 100/500	100	500	150	

## Columns for industrial applications

Type of column	I.D. mm	Length mm	Pressure bar	Note
SEPARCHROM PC01-100/100	100	100	150	
SEPARCHROM PC01-100/250	100	250	150	
SEPARCHROM PC01-100/500	100	500	150	
SEPARCHROM PC01-100/600	100	600	150	
SEPARCHROM PC01-100/700	100	700	150	
SEPARCHROM PC01-100/800	100	800	150	
SEPARCHROM PC01-100/1000	100	1000	150	
SEPARCHROM PC01-150/150	150	150	150	
SEPARCHROM PC01-150/300	150	300	150	
SEPARCHROM PC01-150/500	150	500	150	
SEPARCHROM PC01-150/600	150	600	150	
SEPARCHROM PC01-150/900	150	900	150	
SEPARCHROM PC01-150/1000	150	1000	150	
SEPARCHROM PC01-200/200	200	200	120	
SEPARCHROM PC01-200/400	200	400	120	
SEPARCHROM PC01-200/500	200	500	120	
SEPARCHROM PC01-200/600	200	600	120	
SEPARCHROM PC01-200/800	200	800	120	
SEPARCHROM PC01-200/1000	200	1000	120	
SEPARCHROM PC01-300/300	300	300	100	
SEPARCHROM PC01-300/600	300	600	100	
SEPARCHROM PC01-300/900	300	900	100	
SEPARCHROM PC01-300/1200	300	1200	100	
SEPARCHROM PC01-400/400	400	400	80	
SEPARCHROM PC01-400/800	400	800	80	
SEPARCHROM PC01-400/1200	400	1200	80	



Separchrom PC 01 DS column, 150 mm I.D., hydraulic system with manual oil pump.

## separchrom<sup>PC02</sup>

### HPLC COLUMNS FOR PREP CHROMATOGRAPHY



#### Medium -pressure columns for with axial bed compression

**Separchrom PC02** medium-pressure stainless steel columns are intended for separation where high pressure is not necessary, but good efficiency can be still expected. They are made of a stainless-steel tube, and the input is equipped with a piston made of ultra-high molecular weight polyethylene with a stainless-steel support and stainless-steel mesh frit. A flow distributor with grooves is incorporated within the piston to guarantee a piston flow with nearly zero pressure drop. The design guarantees the simple accessibility of frits for cleaning. Columns can be packed by the dynamic slurry method, by sedimentation, or by sorbent in a dry state (both with silica and polymer sorbents). For soft polymer sorbents, Separchrom PC02 oil systems can be equipped with a special software application in order to compensate for the swelling and shrinking of sorbents in different mobile phases (where the column piston is moved in very small increments up and down during use).

**Separchrom PC02** medium-pressure prep chromatography columns are made of AISI 316L stainless steel, while UHMWE moving pistons are equipped with integral sealing wings. Frits (stainless-steel mesh 5  $\mu\text{m}$  pore size, 5 mm thickness) can be fixed with a stainless-steel ring. The column stand, made of stainless-steel profiles, is included.

#### Columns for laboratory applications

Type of column	I.D. mm	Length mm	Pressure Bar	Note
SEPARCHROM PC02 -25/50	25	50	70	
SEPARCHROM PC02 -25/250	25	250	70	
SEPARCHROM PC02 -50/250	50	250	50	
SEPARCHROM PC02 -50/500	50	500	50	
SEPARCHROM PC02 -100/250	100	250	40	
SEPARCHROM PC02 -100/500	100	500	40	

## Columns for industrial applications

Type of column	I.D. mm	Length mm	Pressure Bar	Note
SEPARCHROM PC02-100/250	100	250	40	
SEPARCHROM PC02-100/500	100	500	40	
SEPARCHROM PC02-150/300	150	300	40	
SEPARCHROM PC02-150/600	150	600	40	
SEPARCHROM PC02-200/400	200	400	35	
SEPARCHROM PC02-200/700	200	700	35	
SEPARCHROM PC02-200/800	200	800	35	
SEPARCHROM PC02-200/1200	200	1200	35	
SEPARCHROM PC02-300/300	300	300	30	
SEPARCHROM PC02-300/600	300	600	30	
SEPARCHROM PC02-300/700	300	700	30	
SEPARCHROM PC02-400/400	400	400	20	
SEPARCHROM PC02-400/800	400	800	20	
SEPARCHROM PC02-400/1200	400	1200	20	
SEPARCHROM PC02-500/500	500	500	10	
SEPARCHROM PC02-500/1000	500	1000	10	
SEPARCHROM PC02-500/1200	500	1200	10	
SEPARCHROM PC02-600/600	600	600	5	
SEPARCHROM PC02-600/1200	600	1200	5	





## separchrom<sup>PC04</sup>

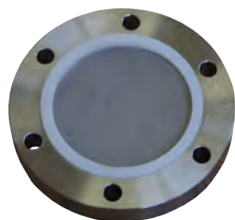
### NON-METAL COLUMNS FOR PREP CHROMATOGRAPHY

#### Non-metal columns with axial bed compression

Polyethylene cartridge columns are usually intended for flash chromatography. Our **Separchrom PC04** columns are more efficient. They are made of high-quality ultra-high molecular weight polyethylene equipped with moving pistons. No metal comes into contact with the mobile phase. Metal-free columns are requested in biochromatography and some special applications.

**Separchrom PC04** plastic columns for preparative liquid chromatography are unfilled and made of ultra-high molecular weight polyethylene. They are equipped with the same pistons on the input and output. The input piston is moved either by flange bolts (type A) or by a central stainless-steel threaded rod (B type). The pistons are fitted with plastic polypropylene frits (10 µm) and a distribution system.

Type of column	I.D. mm	Length mm	Pressure bar	Note
SEPARCHROM PC04-50/150	50	150	16	
SEPARCHROM PC04-50/250	50	250	16	
SEPARCHROM PC04-50/300	50	300	16	
SEPARCHROM PC04-50/500	50	500	16	
SEPARCHROM PC04-100/250	100	250	16	
SEPARCHROM PC04-100/300	100	300	16	
SEPARCHROM PC04-100/500	100	500	16	
SEPARCHROM PC 04-150/300	150	300	6	
SEPARCHROM PC 04-150/600	150	600	6	
SEPARCHROM PC 04-200/400	200	400	6	
SEPARCHROM PC 04-200/800	200	800	6	
SEPARCHROM PC 04-300/500	300	500	5	
SEPARCHROM PC 04-300/900	300	900	5	

**separchrom**<sup>PC06</sup>

## MEDIUM- AND LOW-PRESSURE COLUMNS FOR PREP CHROMATOGRAPHY

**Separchrom PC06** medium-pressure prep chromatography columns are made of stainless steel (AISI 316). They are unfilled and come with fixed flanges on the input and output. They are equipped with liquid input and output. The flange inserts allow the frits (stainless-steel mesh 5 µm pore size, 5 mm thickness) to be readily exchanged. The frits are connected with the liquid-flow distribution system.

## Columns for laboratory applications

Type of column	I.D. mm	Length mm	Pressure bar	Note
SEPARCHROM PC06 -25/50	25	50	100	
SEPARCHROM PC06 -25/250	25	250	100	
SEPARCHROM PC06 -50/250	50	250	50	
SEPARCHROM PC06 -50/500	50	500	50	
SEPARCHROM PC06 -100/250	100	250	40	
SEPARCHROM PC06 -100/500	100	500	40	

## Columns for industrial applications

Type of column	I.D. mm	Length mm	Pressure bar	Note
SEPARCHROM PC06-100/250	100	250	40	
SEPARCHROM PC06-100/500	100	500	40	
SEPARCHROM PC06-150/300	150	300	40	
SEPARCHROM PC06-150/600	150	600	40	
SEPARCHROM PC06-200/400	200	400	35	
SEPARCHROM PC06-200/800	200	800	35	
SEPARCHROM PC06-300/300	300	300	30	
SEPARCHROM PC06-300/600	300	600	30	
SEPARCHROM PC06-400/200	400	200	20	
SEPARCHROM PC06-400/400	400	400	20	
SEPARCHROM PC06-400/800	400	800	20	
SEPARCHROM PC06-500/500	500	500	10	
SEPARCHROM PC06-500/1000	500	1000	10	
SEPARCHROM PC06-600/600	600	600	5	
SEPARCHROM PC06-600/1200	600	1200	5	

## separchrom<sup>PC08</sup>

### HPLC COLUMNS FOR PREP CHROMATOGRAPHY

**Separchrom PC08** columns are designed for high-pressure, high-performance preparative liquid chromatography. They are equipped with a piston on both ends. All metal parts in connection with the mobile phase are made of AISI 316L stainless steel. Upper piston movement is secured by hydraulics, but in comparison with standard models, PC08 hydraulics is incorporated into the bottom column stand, own column is fixed in a robust frame, and the hydraulic piston presses the whole column unit against a special flange in most upper part of the system.



**PC08** are used for high-performance separations in instances where small rigid particles are used as column filling. Only stainless steel and UHMWPE (ultra-high molecular weight polyethylene) are in contact with the mobile phase. Columns are resistant to all common solvents. PC08 columns are designed for industrial separations and typically work with a flow rate of 400 ml/min. – 1400 ml/min. depending on the sorbent type and separation mode. The maximum column pressure is 120 bar.

**PC08** columns are designed either for sedimentation packing with the following axial compression of sorbent bed or for dynamic axial compression packing. Columns with I.D. 150 mm or 200 mm have a special stand with motor-driven high-pressure hydraulic aggregate and hydraulic cylinder (40 tons, 200 - 600 mm stroke, double action) which serves for sorb-ent pressing during the use to compensate bed volume changes as well

**PC08** column stand has a hydraulic system in the bottom part and the column is fixed between the hydraulic cylinder piston and upper stand flange which is connected to the stand box by five rods. The column itself can be removed from the frame without disassembling the fame.

Typically the **PC08** column has the same design as the PC 01 columns - consists of a tube, I.D. 150 mm or 200 mm with a length of 400 - 700 mm. The internal surface of the column is mechanically polished to attain high smoothness. The tube is provided with two screwed stainless steel flanges (tube flanges). Column pistons are equipped with Poremet® 2 frits (3 um porosity) and flow distributors.

Type of column	I.D. mm	Length mm	Pressure bar	Note
SEPARCHROM PC08 -150/500	150	500	150	
SEPARCHROM PC08 -150/700	150	700	150	
SEPARCHROM PC08 -200/500	200	500	120	
SEPARCHROM PC08 -200/700	200	700	120	

## Hydraulic systems for prep chromatography columns

**SEPARPRESS** hydraulic system for prep chromatographic column. Used to compress the piston inside the column and to compact the sorbent. Supplied as a kit that includes a hydraulic double-action cylinder (D) or with a spring (S), connecting hoses, oil pump - manual (M) or driven by motor (E), with a control device mechanical manometer (M) or an electronic system with a pressure gauge (E). Small single-action cylinders are not able to pull a column piston out of the tube, so liquid pressure has to be used instead. Bigger cylinders (D30 +) are delivered only with an electric oil pump, since a high oil-flow rate is necessary. All EE systems can be modified to be used in hazardous environments.

Type and specification	Power t	Stroke mm	Note
SEPARPRESS S005 MM 080	5	80	
SEPARPRESS S005 MM 180	5	180	
SEPARPRESS S005 MM 240	5	240	
SEPARPRESS D005 MM 150	5	150	
SEPARPRESS D010 MM 150	10	150	
SEPARPRESS D010 MM 250	10	250	
SEPARPRESS D020 MM 150	20	150	
SEPARPRESS D020 MM 250	20	250	
SEPARPRESS D030 MM 150	30	150	
SEPARPRESS D030 MM 250	30	250	
SEPARPRESS D050 MM 150	50	150	
SEPARPRESS D050 MM 250	50	250	
SEPARPRESS D100 MM 150	100	150	
SEPARPRESS D100 MM 350	100	350	
SEPARPRESS D150 MM 330	150	330	
SEPARPRESS D010 EE 250	10	250	
SEPARPRESS D020 EE 250	20	250	
SEPARPRESS D030 EE 250	30	250	
SEPARPRESS D050 EE 250	50	250	
SEPARPRESS D100 EE 350	100	350	
SEPARPRESS D150 EE 330	150	330	
SEPARPRESS D030 EEB 250	30	250	
SEPARPRESS D050 EEB 250	50	250	
SEPARPRESS D010 AM 250	10	250	
SEPARPRESS D020 AM 250	20	250	
SEPARPRESS D030 AM 250	30	250	

First three numbers defines the maximum compressive strength of the piston in tons, next three numbers define the maximum stroke of the piston in mm

EEB - supplied as a box UP, DOWN, HOLD buttons on the front panel, column is inserted in a frame on top side of the box.

AE - Electronic control of solenoid valves, oil pump driven by compressed air, electronic pressure gauge

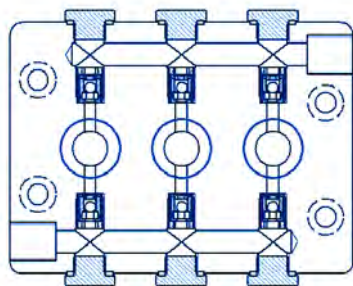
AM - Mechanical valves control, oil pump driven by compressed air, mechanical gauge

**All Separlab made columns are designed and manufactured in accordance with EU regulation for pressure vessels and can be delivered with PV certificate. All stainless steel columns can be delivered with ATEX certificate as well.**

## MOBILE PHASE DELIVERY SYSTEMS

**separatrix**<sub>PP03</sub>

## MULTI PISTON PUMPS

**Piston pulse less pumps**

**Separatrix PP03** are pulse less triplex piston pumps designed for preparative chromatography applications - nevertheless they can be used everywhere, where high pressure, precise flow without pulsations and high resistance against corrosion is needed. Pumps are equipped with unique compact three piston head for smooth flow and easy maintenance without a risk of leakage on connecting parts. Back flushed pistons are covered by hard and chemically resistant polycrystalline carbon layer. Piston cylinders have low dead volume and samples injected through the pump appear low spreading.

Pumps with different flow rate ranges differ only in head type, piston diameters and tubing diameters. **Separatrix PP03** are usually supplied with an asynchronous motor and frequency converter but are also available with step motor which allows using the pump in extremely broad range of flow rates - both for analytical and preparative applications.

Special configurations of **Separatrix PP03** pumps are used for three phases low pressure gradient - in this case is extremely important that these pumps offer nearly constant flow rate not only on the output but on the input too. Low pressure gradient units are delivered with three solenoid valves on the plate which can be connected to the pump side. Power supply for valves is installed inside the pump box. 10 linear steps can be programmed.

**Separatrix PP03** pumps are delivered in configuration for high pressure binary gradient as well. Two pumps - master and slave types - are working together. Master pump controls the flow rate and gradient composition (10 linear steps), slave pump is delivered without control display, keyboard(s) and pressure sensor. All **Separatrix PP03** pumps are equipped keyboard(s) and graphic display. There is a possibility to set flow rate, pressure limit and flow correction. A second keyboard is included for gradient programming in case of low pressure gradient pumps and high pressure gradient master pumps.

**Separatrix PP03** can be used in mode of remote control. Pumps can cooperate with Clarity data station (Dataapex). Flow rate, gradient composition and pressure limit can be programmed. Control module for PP 03 pumps was successfully tested and agreed by Dataapex. PP 03 pumps can be controlled using Ecom software **ECOMAC** as well

Type	Description & technical parameters
<b>SEPARTRIX PP03 A</b>	Piston pulsless pump, three pistons O.D. 10 mm with diamond layer in one stainless steel head, ceramic ball valves, 620 W AC motor vector frequency converter, flow rate 25 ml/min. – 800 ml/min., 260 bar (3500 PSI), pressure measurement and limit, membrane keyboard, graphic display
<b>SEPARTRIX PP03 B</b>	Piston pulsless pump, three pistons O.D. 14 mm with diamond layer in one stainless steel head, ceramic ball valves, 620 W AC motor with vector frequency converter, flow rate 50 ml/min. – 1600 ml/min., 160 bar (2100 PSI), pressure measurement and limit, membrane keyboard, graphic display
<b>SEPARTRIX PP03 C</b>	Piston pulsless pump, three pistons O.D. 20 mm with diamond layer in one stainless steel head, ceramic ball valves, 620 W AC motor with vector frequency converter, flow rate 100 ml/min. – 3200 ml/min., 80 bar (1100 PSI), pressure measurement and limit, membrane keyboard, graphic display
<b>SEPARTRIX PP03 AG</b>	PP03 A pump, flow rate 25 ml/min. – 800 ml/min., max. 260 bar (3500 PSI), three phases low pressure gradient included, (3 x solenoid valves + connecting armature on own holder+3 x valve power supply in pump unit), second keyboard for gradient control
<b>SEPARTRIX PP03 BG</b>	PP03 B pump, three phases, flow rate 50 ml/min. – 1600 ml/min., max. 150 bar (2100 PSI), low pressure gradient included (3 x solenoid valves + connecting armature on own holder+3 x valve power supply in pump unit), second keyboard for gradient control
<b>SEPARTRIX PP03 CG</b>	PP03 C pump, flow rate 100 ml/min. – 3200 ml/min., 80 bar (1000 PSI), three phases low pressure gradient included, (3 x solenoid valves + connecting armature on own holder+3 x valve power supply in pump unit), second keyboard for gradient control
<b>SEPARTRIX PP03S A</b>	Piston pulsless pump, three pistons O.D 10 mm with diamond layer in one stainless steel head, ceramic ball valves, step motor, flow rate 1 ml/min. – 400 ml/min., 250 bar (3500 PSI), pressure measurement and limit
<b>SEPARTRIX PP03S B</b>	Piston pulsless pump, three pistons O.D 14 mm with diamond layer in one stainless steel head, ceramic ball valves, step motor, flow rate 1 ml/min. – 800 ml/min., 150 bar (2100 PSI), pressure measurement and limit, membrane keyboard, graphic display
<b>SEPARTRIX PP03S C</b>	Piston pulsless pump, three pistons O.D 20 mm with diamond layer in one stainless steel head, ceramic ball valves, step motor, flow rate 2 ml/min. – 1600 ml/min., 70 bar (800 PSI), pressure measurement and limit, membrane keyboard, graphic display
<b>SEPARTRIX PP03S AG</b>	PP03S A pump, flow rate 1 ml/min. – 400 ml/min., 250 bar (3500 PSI), three phases low pressure gradient included, (3 x solenoid valves + connecting armature on own holder+3 x valve power supply in pump unit), second keyboard for gradient control
<b>SEPARTRIX PP03S BG</b>	PP03S B pump, flow rate 1 ml/min. – 800 ml/min., 150 bar (2100 PSI), three phases low pressure gradient included, (3 x solenoid valves + connecting armature on own holder+3 x valve power supply in pump unit), second keyboard for gradient control
<b>SEPARTRIX PP03S CG</b>	PP03S B pump, flow rate 2 ml/min. – 1600 ml/min., 70bar (800 PSI), three phases low pressure gradient included, (3 x solenoid valves + connecting armature on own holder+3 x valve power supply in pump unit), second keyboard for gradient control
<b>SEPARTRIX PP03SM A</b>	PP03S A pump, flow rate 0,5 ml/min. – 400 ml/min., 250 bar (3500 PSI), master pump for binary high pressure gradient, second keyboard for gradient programming
<b>SEPARTRIX PP03SM B</b>	PP03S B pump, flow rate 1 ml/min. – 800 ml/min., 150 bar (2100 PSI), master pump for binary high pressure gradient, second keyboard for gradient programming
<b>SEPARTRIX PP03SM C</b>	PP03S C pump, flow rate 2 ml/min. – 1600 ml/min., 70 bar (800 PSI), master pump for binary high pressure gradient, second keyboard for gradient programming
<b>SEPARTRIX PP03SS A</b>	PP03SS A pump, flow rate 0,5 ml/min. – 400 ml/min., 250 bar (3500 PSI), slave pump for binary gradient, no display, no keyboard
<b>SEPARTRIX PP03SS B</b>	PP03SS B pump, flow rate 1 ml/min. – 800 ml/min., 150 bar (2100 PSI), slave pump for binary gradient, no display, no keyboard
<b>SEPARTRIX PP03SS C</b>	PP03SS C pump, flow rate 2 ml/min. – 1600 ml/min., 70 bar (800 PSI), slave pump for binary gradient, no display, no keyboard

**SEPARTRIX PP03 pumps with asynchronous motors are available in variants Ex (ExG), where mechanical part – gearbox, cambox and pistons head with ATEX (T4) motor - is separated from remote box with frequency changer and electronic part of the pump. Remote box has to be placed out of the explosion environment place.**

## hydracell<sup>G03, G04, G10</sup>

### PISTON MEMBRANE PUMPS

The piston-diaphragm pumps **Hydracell** with multimembrane head provide smooth pulseless flow in a wide range of flow rates and delivery pressure with high repeatability and accuracy and are ideal for dosing mobile phase into large preparative units.

**Hydracell** G03 is the piston-diaphragm pump with anti cavitation system "Kell-Cell". Special system of channels equalizing pressure on both sides of the membrane, which prevents cavitation damage of the pump. Stainless steel head and sturdy construction ensure long life and minimal maintenance costs, as well as double hydraulically balanced diaphragm and sealing free piston design. Checking the oil level stops the engine when the level drops to prevent mixing of oil into the mobile phase in the case of destruction of some of the membranes.

- Smooth pulse less flow
- Anti-cavitation system Kell-Cell
- "Heavy Duty" design
- Hydraulically balanced diaphragm on both sides
- Wide range of flows and delivery extrusion heights
- Repeatability and high accuracy - ideal for dosing
- Piston sealing free design - minimal maintenance costs



Wanner **Hydracell** G10 with cam are used for different types of applications, usually involving liquids recycling. They provide smooth pulse less flow in a wide range of flow rates and pressures with high repeatability and accuracy and are ideal for dosing. Checking the oil level in the pump, followed by stopping the engine when the level drops, to prevent mixing of oil into the mobile phase in the case of destruction of some of the membranes.

- Smooth pulse less flow
- Anti-cavitation system Kell-Cell
- "Heavy Duty" design
- Hydraulically balanced diaphragm on both sides
- Wide range of flows and delivery extrusion heights
- Repeatability and high accuracy - ideal for dosing
- Piston sealing free design - minimal maintenance costs

The pumps are equipped with heads made of stainless steel (AISI 316). They are suitable for temperatures up to 70° C and are supplied with engine, clutch and durable metal frame for installation in industry. Both G03 and G10 pumps can be supplied also in a version for hazardous areas according to ATEX Ex de II T4.

Wanner **Hydracell** G04 are used for high flow, high pressure application. They also can be used in higher temperature range. They are the piston-diaphragm pumps with anti cavitation system "Kell-Cell". Special system of channels equalizing pressure on both sides of the membrane, which prevents cavitation damage of the pump. Stainless steel head and sturdy construction ensure long life and minimal maintenance costs, as well as double hydraulically balanced diaphragm and sealing free piston design.



**PRESSURE FILTERS on pump output**

Pressure filters are closed pressure vessels made of two flanges with a frit (filter) between input and output. They are quite similar to prep chromatography columns in fact. *Separfil* XXX/YYY units are designed with a filter frit made either of stainless steel (3 µm pore size) or of non woven polypropylene fabric (10 µm pore size). Frit (filter) sealing is made of UHMWPE. Pressure filters make good service to save input column frit as samples under separation are a source of solid or gel particles. XXX numbers specify frit diameter and YYY number maximal pressure for filter use.

Type	Max. flow l/min.	Max. pressure bar	Note
HYDRACELL G-03-X	11,3	69	
HYDRACELL G-03-E	8,3	83	
HYDRACELL G-03-S	6,8	83	
HYDRACELL G-10-X	29	70	
HYDRACELL G-10-I	14,9	70	
HYDRACELL G-04 X	11,3	170	
HYDRACELL G-04-E	7,8	170	
HYDRACELL G-04-S	6,1	170	

# GRADIENT FORMING DEVICES



## separmix<sub>P</sub>

### PROGRAMMING UNITS

**Separmix P** is a low pressure gradient programming unit situated in a stainless steel box with graphic display and membrane keyboard on oblique front panel. It is used in combination with a set of solenoid valves **Separmix V** to form a low pressure gradient of mobile phase on the pump input. Gradient program consist of 10 linear steps for two or three liquids. Programming unit SEPARMIX is connected by cable to each gradient valve. Remote control of the instrument is possible with larger valves.

## separmix<sub>V</sub>

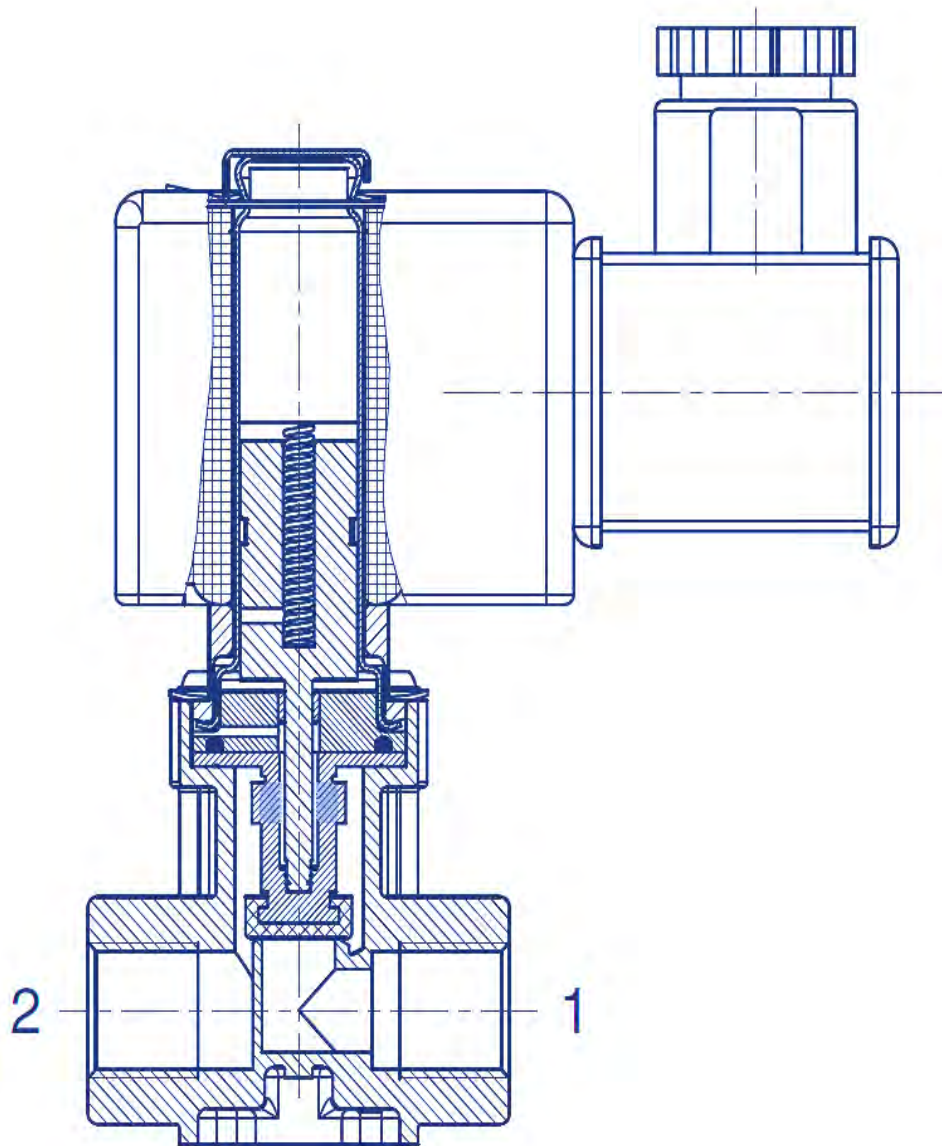
### GRADIENT VALVES



**Separmix V** is a series of gradient valves different sizes for low pressure gradient forming. They are designed to be controlled either from a pump **Separtrix PP03** (G) or from a single programming unit Separmix PX. Special solenoid valves can be used for the control of even aggressive liquids in the pharmaceutical, chemical and biochemical industries. Valves suited for all applications in which the fluids must not come into contact with the magnetic metal kern of the solenoid valve are available as an option. Each set of valves is completed by manifolds on the input and output to allow the connection to the liquid reservoirs on one side and to the chromatography pump on the opposite side. The manifold with valves is situated on a stainless steel plate. Plates are equipped either with legs, or can be connected directly to the pump PP03 from its left side.

There are three dimensions of gradient mixer valves sets depending on maximal flow rate. Maximum liquid viscosity to be used with mentioned valves systems is 40 cSt (mm<sup>2</sup>/s) and temperature range -10 °C to +90 °C. Material in contact with fluid are: stainless steel, PTFE and UHMWPE. Maximal input pressure is 2 bars

Type	Flow rate ml/min.	Valves number	Note
SEPARMIX V3S	10 - 1000	3	
SEPARMIX V3M	100 - 3000	3	
SEPARMIX V3L	500 - 6000	3	



Gradient valve with sealed electromagnetic kern.

# DETECTORS FOR PREP CHROMATOGRAPHY

## photometric UV-VIS detectors

### FOR PREPARATIVE CHROMATOGRAPHY

Ecom (Prague CR) manufactures UV-VIS detectors which can be used in prep chromatography. They are equipped with diode array and thus monitor more wavelengths to verify purity of analyzed samples or to be used in situations when some substances absorb on different wavelengths. There are alternatives with remote cells available too (for large scale systems).



All detectors can be controlled manually by keyboard and display but also using RS232, USB or LAN and proper software (Clarity, Ecomac). At the back panel are available four analog outputs and connector for I/O logical input and output signals.

#### The unit's DAD (diode array detector) design offers many advantages:

- online scan of whole spectrum with speed up to 20 Hz which allows to create 3D picture.
- lamp work hours are counted using the built-in counter for both deuterium and halogen lamps.
- the cell is easy to replace from the side of the detector.
- easy service and diagnostic using display and keyboard or by service SW.

Type	Specification
<b>TOY18DAD 400 H Two Channel UV Detector</b>	Stand alone PDA detector measures at two wavelengths simultaneously in range 200 - 400 nm with possibility to see current scan.
<b>TOY18DAD 400 H Four Channel UV Detector</b>	Stand alone PDA detector measures at two wavelengths simultaneously in range 200 - 400 nm with possibility to see current scan.
<b>TOY18DAD 400 H Scanning Channel UV Detector</b>	Stand alone PDA Scanning detector measures at four wavelengths simultaneously in range 200 - 400 nm or sends scan with speed up to 20 Hz which allows to create 3D picture
<b>TOY18DAD 400 V Scanning UV Detector</b>	An UV (UV-VIS) diode array detector, which allow measuring absorbance of four wavelengths simultaneously in one cell just as measuring of whole spectrum (scan).
<b>TOY18DAD 400 VEX Scanning UV Detector</b>	UV (UV VIS) diode array detectors, which allow measuring absorbance of four wavelengths simultaneously in external cell connected by optical cables, just as measuring of whole spectrum (scan).
<b>TOY18DAD 600 H Two Channel UV Detector</b>	Stand alone PDA detector measures at two wavelengths simultaneously in range 200 - 600 nm with possibility to see current scan.
<b>TOY18DAD 600 H Four Channel UV Detector</b>	Stand alone PDA detector measures at two wavelengths simultaneously in range 200 - 600 nm with possibility to see current scan.
<b>TOY18DAD 600 H Scanning Channel UV Detector</b>	Stand alone PDA Scanning detector measures at four wavelengths simultaneously in range 200 - 600 nm or sends scan with speed up to 20 Hz which allows to create 3D picture.
<b>TOY18DAD 600 V Scanning UV Detector</b>	An UV (UV-VIS) diode array detector, which allow measuring absorbance of four wavelengths simultaneously in one cell just as measuring of whole spectrum (scan).in range 200 – 600 nm
<b>TOY18DAD 600 VEX Scanning UV Detector</b>	UV (UV VIS) diode array detectors, which allow measuring absorbance of four wavelengths simultaneously in external cell connected by optical cables, just as measuring of whole spectrum (scan) in range 200 – 600 nm
<b>TOY18DAD 800 H Two Channel UV Detector</b>	Stand alone PDA detector measures at two wavelengths simultaneously in range 200 - 800nm with possibility to see current scan.
<b>TOY18DAD 800 H Four Channel UV Detector</b>	Stand alone PDA detector measures at two wavelengths simultaneously in range 200 - 800 nm with possibility to see current scan.
<b>TOY18DAD 800 H Scanning Channel UV Detector</b>	Stand alone PDA Scanning detector measures at four wavelengths simultaneously in range 200 - 800 nm or sends scan with speed up to 20 Hz which allows to create 3D picture.
<b>TOY18DAD 800 V Scanning UV Detector</b>	An UV (UV-VIS) diode array detector, which allow measuring absorbance of four wavelengths simultaneously in one cell just as measuring of whole spectrum (scan) in range 200 – 800 nm

## cells



### FOR PHOTOMETRIC DETECTORS

Preparative **cells** for Ecom photometric detectors can be divided into two groups. Standard inner cells are situated inside the detector unit and connection with the column is made by stainless steel or PTFE made tubing. External cells are situated on the column output and are connected to the detector by optical fiber cables.

Type	Optical length mm	Cell volume $\mu$ l	Flow rate ml/min.	Connection
PLCC 3L	0,3	80	3000	3/16", 5/16"- 24
	1,9 – 2,1	100		
	3,7 – 3,9	120		
PLCC 04	0,4	40	200	1/16" x 1mm
	1,3 – 1,4	55		
	2,3 – 2,4	70		
PLCC 05	0,3 – 0,4	40	500	1/8" x 1/16"
	1,3 – 1,4	55		
	2,3 – 2,4	70		
PLCC 14	0,1 +/- 0,05	40	500	1/8" or 1/16", 1/4"- 28
	1,3 – 1,4	55		
	2,3 – 2,4	70		
PLCC 15	0,3 +/- 0,05	40	500	1/8" or 1/16", 1/4"- 28
	1,3 – 1,4	55		
	2,3 – 2,4	70		
PLCC 15 EX	0,3 +/- 0,05	40	500	Customer
	1,3 – 1,4	55		
	2,3 – 2,4	70		
PLCC 20 High Flow			15 000	1/2", 1/4"- 18

## separpass

### AUTOMATIC FLOW SPLITTING



**Separpass** is a device which enables to use detector cells for preparative liquid chromatography together with analytic detectors. Often older analytic detectors are available, but due the low flow rates and limited pressures on the cell cannot be used. separpass allows the small amount of liquid to flow through the detector, while a large number of phases bypasses the detector cell. An over-pressure for detector is generated by a spring force. Pressure drop for the detector can be changed by a control knob. The bypass eliminates any adjustment of the flow during separation - only on the beginning is set spring force by a rotating knob. The pressure on the detector cell can be set in the range 1 - 3 bar.

Type	Fitting on detector side	Fitting on main flow side
SEPARPASS 01	1/16"	1/8"
SEPARPASS 02	1/16"	1/4"
SEPARPASS 03	1/8"	1/2"
SEPARPASS 04	1/4"	3/4"



## FRACTION COLLECTORS

**separflow** FFC 40

## LABORATORY FRACTION COLLECTOR FOR PLC

Fraction collector **Separflow FFC 40** is a portable turntable carousel collector with a plate diameter of 400 mm, which is equipped with a circle of small funnels with tubing output. Liquid (total of 40 positions can be collected to different types of vessels).

Collector is designed for flow rates up to 800 ml/min. And funnels are designed such way, that liquid can not flow outside during arm movement to new position.

Control collector (keypad and backlit graphic display) is located on the sloping front panel of stainless steel cabinet staying separately. In the corousel unit is located step motor and gearbox only. Head with a transverse beam is easily removable. Own plate is made of combination of stainless steel and UHMW polyethylene with excellent chemical resistance. Electronics collectors enables simple sequential programming (may be used a maximum number of positions or less than maximum number). Move to the next position can be controlled from an external source.



## separflow X-Y

### FRACTION COLLECTORS FOR INDUSTRY



Separflow fraction collectors can be delivered for environments with danger of explosion according ATEX. Electronic part of the system has to be situated on remote place out of the critical zone.

Fraction collectors **Separflow FC X-Y** are designed to capture fractions in prep liquid chromatography. However, they can be used in other facilities where programmed collecting of liquid volume is required. It is designed for liquids, which are resistant to stainless steel, PTFE (polytetrafluoroethylene) and UHMW polyethylene. **Separflow FC X-Y** typically consists of a stainless steel box of electronics with the keyboard and the display on oblique front panel and a circular segment consisted from two parts with a radial groove in between (which cross section is equivalent to a tube with I.D. X mm). The groove has side outputs to which a liquid input and Y solenoid valves (with PTFE closing elements) on output are connected. Opening various valves is programmed. The outlet valves pipes are connected by flexible hoses and are forwarded to the liquid containers of proper size. Collector can be controlled independently from the front panel keyboard or externally via RS232 serial port. In the external control is the keypad locked and it is possible only to display parameters. Always nevertheless works STOP button. Step time is 0,1 – 180 min. and pressure limit 2 bar.

Type	Channel I.D. mm	Fraction number	Flow rate ml/min.	Note
SEPARFLOW 5-5	5	5 + waste	50 - 1500	
SEPARFLOW 5-10	5	10 + waste	50 - 1500	
SEPARFLOW 10-5	10	5 + waste	300 - 3000	
SEPARFLOW 10-10	10	10 + waste	300 - 3000	

## TEMPERATURE CONTROL



## separtherm<sup>TJ</sup>

### TEMPERATURE CONTROL COLUMN JACKETS

Thermostat column jackets **Separtherm TJ** are universal acrylic glass jackets for heating or cooling of preparative liquid chromatography columns on temperatures between  $-10\text{ }^{\circ}\text{C}$  and  $+90\text{ }^{\circ}\text{C}$ . Water from circulating device is coming to a bottom input on the side of bottom circular plate and then is moving along the column up to the upper jacket plate where is an output. **Separtherm TJ** jackets are designed to keep on the selected temperature the column itself. In some cases but, depending on column dimensions, mobile phase flow rate and temperature, may be necessary either to form a spiral exchanger from column input tubing sank in the jacket or to use a special exchanger to reach proper temperature inside the column.

**Separtherm TJ** jackets are equipped with a simple stand.

Columns TJ jackets are equipped with a simple stand

Type	Jacket tube I.D. mm	Column I.D. mm	Column length mm
SEPARTHERM TJ 50/500	110	50	600
SEPARTHERM TJ 100/500	180	100	700
SEPARTHERM TJ 150/600	230	150	700
SEPARTHERM TJ 200/800	280	200	1000



## separtherm<sup>WISD</sup>

### CIRCULATING BATHS

More and more application in PLC is realized by high or low temperatures. Columns can be equipped with thermostated jackets for such use and liquid for them is prepared in circulating baths. Separlab offers robust instruments covered in stainless steel boxes.

Type	Description
SEPARTHERM WCB 6	Thermostated heating bath, volume 6 l, robust circulation pump (5 l/min.), processor, foil keyboard control, graphic display, stainless steel cabinet
SEPARTHERM WCR P6	Thermostated heating and cooling bath, volume 6 l, robust circulation pump (5 l/min), cooling compressor, processor, foil keyboard control, graphic display, stainless steel cabinet

# PLC INDUSTRIAL SYSTEMS

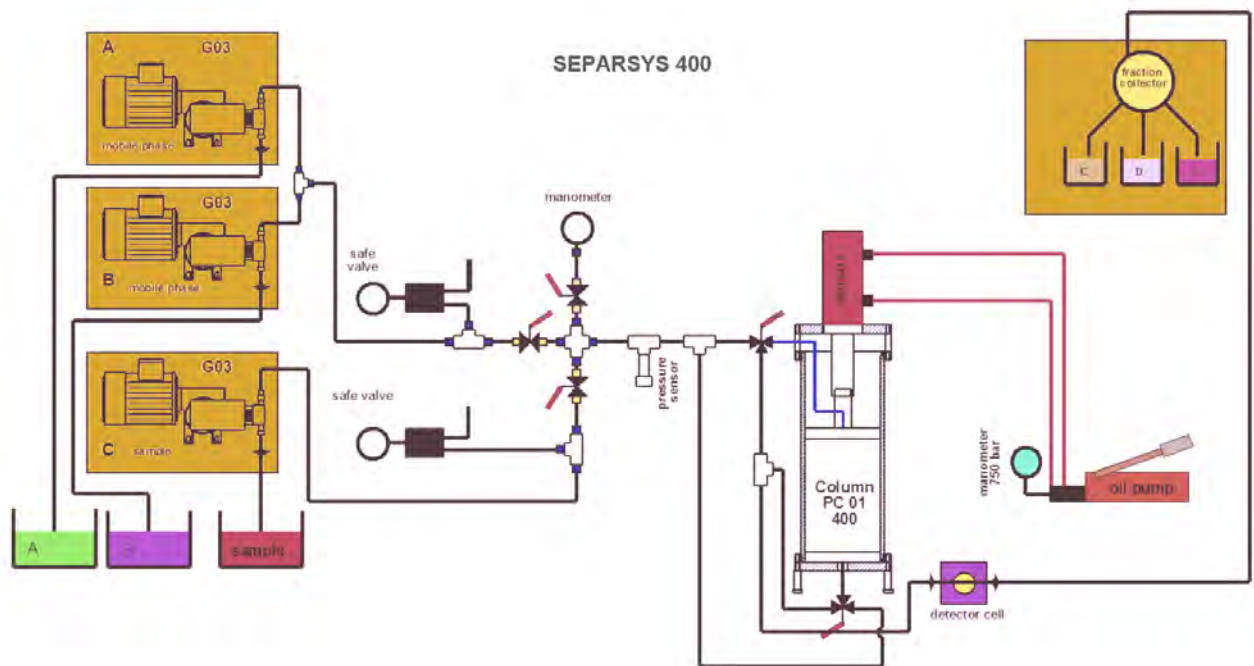
## separsys HP 400, 800 FP, 300 DS

### INDUSTRIAL SEPARATION UNITS - HIGH PRESSURE

Industrial preparative chromatographs are usually tailored according user's need. Therefore only an example of already delivered unit is introduced here. It is recommended to contact company specialists when a system specification is developed.

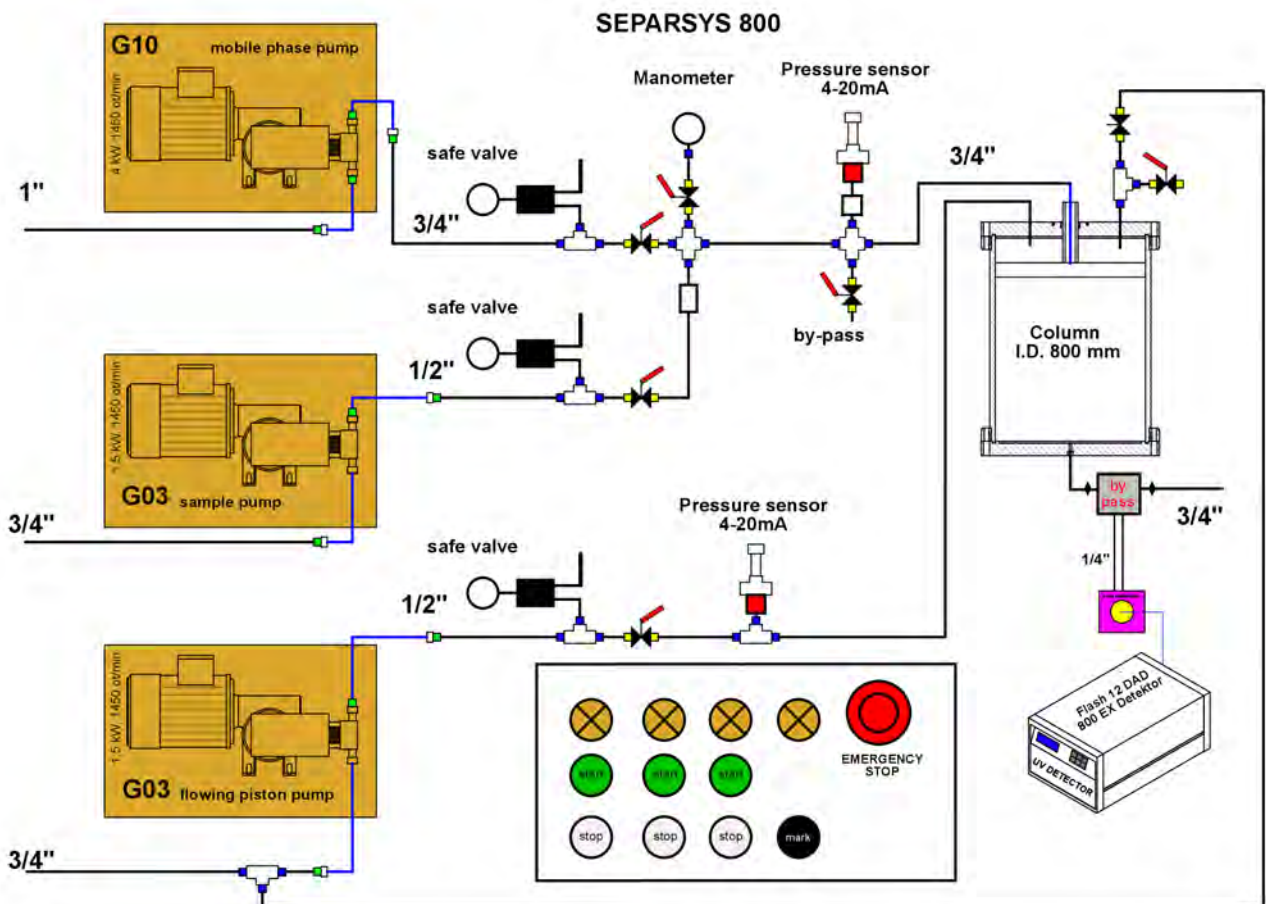
**Separsys HP 400** is an industrial unit for liquid high efficiency, high pressure preparative chromatography. It can be used for isocratic, high pressure, high performance chromatography. It is completely controlled by modified **ECOMAC** software only. The unit consists of (see schematic drawing):

- high-pressure column **Separchrom PC01 400** with an inside diameter 399 mm and length 1000 mm, column is packed with 15  $\mu\text{m}$  spherical silica (sedimentation procedure of packing), maximum pressure 80 bar
- block of mobile phase delivery control (including bypass and flow reversing) provided with manual high-pressure ball valves and electronic pressure sensors
- to the output column fixed detector **cell PLCC 15 Ex** and a **detector FLASH 06S DAD 600 EX**
- three membrane pumps **Hydracell P3** (up to 8 l/min. and 70 bar each, oil level control) - two are in parallel and supply the mobile phase, the third delivers the mixture to be separated
- remote switchboard with three units of frequency converters ABB which supply power to pump motors and allow flow changes and electronic control unit separel 01
- PC computer using a modified software **ECOMAC** to set parameters of the separation process and to monitor both detector signal and column pressure



**Separsys 800 FP** is an industrial unit for liquid high efficiency, high pressure preparative chromatography. It can be used for iso-cratic, high pressure, high performance chromatography. It is completely controlled by modified **ECOMAC** software only. The unit consists of (see schematic drawing):

- new high-pressure column Sepachrom PC05 800 with an inside diameter 799 mm and length 1000 mm, column is packed with 15  $\mu$  spherical silica (sedimentation procedure of packing) and equipped with a special floating piston, maximum pressure 50 bar.
- block of mobile phase delivery control (including bypass) provided with air controlled high-pressure ball valves and electronic pressure sensors.
- to the output column is connected detector cell PLCC 15 Ex through an automatic bypass system **Sepparpass 03** (cell is in 10 m distance from the column) and a **detector FLASH 06S DAD 600 EX**
- three membrane pumps **Hydracell** G3 and G10 (up to 8 l/min. and 70 bar each, oil level control, 27 l/min, 70 bar for G10) – G10 supplies the mobile phase, one G3 is injecting the sample and the second moves the column piston the third delivers the mixture to be separated.
- remote switchboard with three units of frequency converters ABB ACS 550-01-06A9-4, which supply power to pump motors and allow flow changes and electronic control unit **separel 01**.
- PC computer using a modified software **ECOMAC** to set parameters of the separation process and to monitor both detector signal and column pressure.





**Separsys 300** is an industrial unit for liquid high efficiency, high pressure preparative chromatography. It can be used for isocratic, high pressure, high performance chromatography. It is completely controlled by modified **ECOMAC** software only. The unit consists of (see schematic drawing):

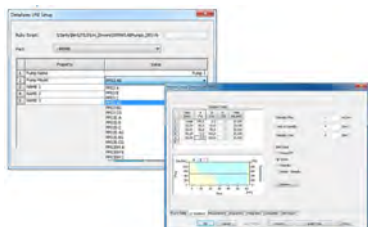
- high-pressure column **Se parchrom PC01**\_1300 with an inside diameter 299 mm and length 1300 mm, full column length piston stroke; column is packed with 10  $\mu$  spherical silica by dynamic slurry method, maximum pressure 100 bar.
- hydraulic system **Se parpress** D100 EE 1300 having a power 100 tons and stroke 1300 mm, fed by an electric motor driven oil pump with pressure control, maximum oil pressure 200 bar.
- block of mobile phase delivery control (including bypass) provided with manual controlled high-pressure ball valves and electronic pressure sensors.
- block of flow reversion which allow to change flow direction in the column.
- to the output column is connected detector **cell** PLCC 15 Ex through an automatic bypass system **Se parpass** 03 (cell is in 10 m distance from the column) and a **detector FLASH 06S DAD 600 EX**.
- two membrane pumps **Hydracell** G04 (up to 8 l/min. and 120 bar each, oil level control) supply the mobile phase and the sample.
- remote switchboard with three units of frequency converters ABB, which supply power to pump motors and allow flow changes of mobile phase, sample and oil and electronic control unit separel 04.
- PC computer using a modified software **ECOMAC** to set parameters of the separation process and to monitor both detector signal and column pressure.

# SOFTWARE FOR PLC

## clarity

### CLARITY ADVANCED CHROMATOGRAPHY DATA STATION (CDS) WITH SOFTWARE MODULE FOR CONTROL OF ALL SEPARLAB INSTRUMENTS AND DEVICES

**Clarity** is a modern and universal data station which allows to monitor detector signals (including diode detector spectra) to evaluate them, to calculate and use calibration curves and evaluate column efficiency. It perfectly process chromatography data including problematic peaks integrating. Extensions provide functions for specific separation techniques such as GPC.



Together with optional control LC module Clarity provides the possibility of complete chromatography handling system. SEPARLAB modules (pump PP 03 module and fraction collector FC module) were tested by Dataapex and they are now fully integrated in Clarity system. It is possible to program both pump flow rate and gradient composition from the PC as well as simply fill data tables for fraction collectors with five or ten outputs. Each Separlab component can be simply connected to PC through USB port. Fully valid method of each experiment is automatically saved in chromatogram file.

**Clarity** is fully ready to support tools for GLP / 21 CFR Part 11. Certificate of Software Validation is a document that certifies that the software was developed, tested and structurally validated following a Certificate Quality System conforming to GLP, GAMO, GMP and ISO 9001 Guidelines. The Test IQ (Installation Qualification) is an integral component of the station. This test monitors that the software has been properly installed and the results can be accessed from a printed protocol. Validator for OQ (Operational Qualification) is an optional package available for testing and validating the station. Logon with Password and User Accounts forming with selectable rights, unique user profiles are here. Password expiration and minimal length as well as electronic signature are implemented. Audit Trail of whole system, chromatograms, calibrations and sequence is possible. History of all methods and calibrations are saved as part chromatogram files. And not only this!

#### CLARITY DATASTATION SYSTEMS

Specification	Identification
Clarity Extensible single instrument SW CFR21/GLP read	C50
Clarity Lite Simplified single instrument SW	C40
Specification Extension modules for Clarity	Identification
Clarity ADD-on single instrument add-on	C55
SST SW module for system suitability test	A22
GPC SW module for GPC/SEC data processing	A28
PDA SW module for PDA data processing	A29
Specification Control modules for Clarity	Identification
LC control SW module for HPLC control	A24
Specification Hardware - A/D and D/A converters for clarity	Identification
Colibrick set external USB, 1 channel cable	U31
Colibrick set external USB, 2 channels cable	U32
Colibrick set external USB, 4 channels cable	U34
Validation Kit peak generator and SW methods for OQ	CVK

## UNIVERSAL CHROMATOGRAPHIC SOFTWARE FOR CONTROL AND MONITORING

Software **ECOMAC** is designed with maximal effort to make easy operation of Separlab chromatographic systems with detectors made by ECOM. It is suited for both units controlling and data collecting. Equipments are connected to the PC using RS232, or USB (by means of RS232/USB converter). Software detects automatically almost of all units, so there is no need complicated communication installation:

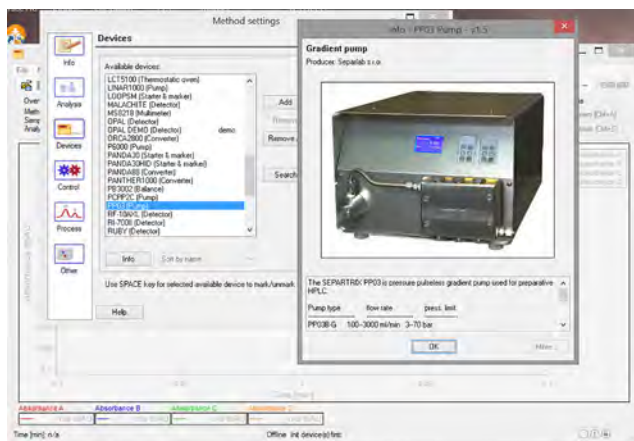
### Program most important features:

- Easy installation
- Connecting using USB or RS232
- No need A/D converter
- Possibility to start up to 8 stations at the same time
- Data export in various formats
- Possibility of external start and external mark
- Secured access
- Unit controlling and data collecting from one place

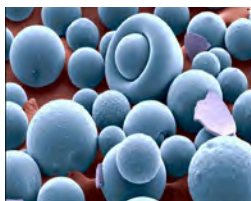
On the screen we can watch parameters of all units for example detector absorbance, pump pressure and column oven temperature. It is possible to record, print and export all data. It is impossible to evaluate chromatograms and used method is not saved with chromatogram.

### Supported formats by data export:

- Text formats: native text format, two column text format and CSW Clarity text format
- Binary: native binary CH-format, CSW (1.7) Raw format, Matlab 5.0(Octave) MAT format, AIA NETCDF



## SORBENTS SEPARSPHER



**Separspher** is perfectly spherical highly pure silica with a high pressure resistance. Sorbents are made by standard procedures in a wide range of sizes of pores, so that both can be used for chromatography of low molecular weight and high molecular weight compounds including the SEC and GPC. Materials for reverse phase chromatography are characterized by effective endcapping. For chromatography, where the mobile phase which contains a very high percentage of water must be used RP sorbents which active layer is containing a small amount of polar groups (aqua) are delivered. Practically absolute endcapping is achieved by reaction in the gaseous phase and is used for sorbents labeled HE. These sorbents may therefore be successfully used for the SEC hydrophobic synthetic polymers. For SEC chromatography, hydrophilic polymers and biopolymers are useful materials labeled DIOL.

Sorbent	Particle diameter (µm)	Modification type
SEPARSPHER SI 70	5, 10, 15, 30	No modification
SEPARSPHER SI 100	5, 10, 15, 30	No modification
SEPARSPHER SI 200	5, 10, 15, 30	No modification
SEPARSPHER SI 300	5, 10, 15, 30	No modification
SEPARSPHER SI 100 C18	5, 10, 15, 30	Alkyl chain C18 and endcapping
SEPARSPHER SI 200 C18	5, 10, 15, 30	Alkyl chain C18 and endcapping
SEPARSPHER SI 300 C18	5, 10, 15, 30	Alkyl chain C18 and endcapping
SEPARSPHER SI 100 C18 aqua	5, 10, 15, 30	Alkyl chain C18 and polar groups
SEPARSPHER SI 200 C18 aqua	5, 10, 15, 30	Alkyl chain C18 and polar groups
SEPARSPHER SI 300 C18 aqua	5, 10, 15, 30	Alkyl chain C18 and polar groups
SEPARSPHER SI 100 C8	5, 10, 15, 30	Alkyl chain C8 and endcapping
SEPARSPHER SI 200 C8	5, 10, 15, 30	Alkyl chain C8 and endcapping
SEPARSPHER SI 300 C8	5, 10, 15, 30	Alkyl chain C8 and endcapping
SEPARSPHER SI 100 C8 aqua	5, 10, 15, 30	Alkyl chain C8 and polar groups
SEPARSPHER SI 200 C8 aqua	5, 10, 15, 30	Alkyl chain C8 and polar groups
SEPARSPHER SI 100 C18 HE	5, 10, 15, 30	Alkyl chain C18 and HE endcapping
SEPARSPHER SI 200 C18 HE	5, 10, 15, 30	Alkyl chain C18 and HE endcapping
SEPARSPHER SI 300 C18 HE	5, 10, 15, 30	Alkyl chain C18 and HE endcapping
SEPARSPHER SI 100 C8 HE	5, 10, 15, 30	Alkyl chain C8 and HE endcapping
SEPARSPHER SI 200 C8 HE	5, 10, 15, 30	Alkyl chain C8 and HE endcapping
SEPARSPHER SI 300 C8 HE	5, 10, 15, 30	Alkyl chain C8 and HE endcapping
SEPARSPHER SI 100 C4 HE	5, 10, 15, 30	Alkyl chain C4 and HE endcapping
SEPARSPHER SI 200 C4 HE	5, 10, 15, 30	Alkyl chain C4 and HE endcapping
SEPARSPHER SI 300 C4 HE	5, 10, 15, 30	Alkyl chain C4 and HE endcapping
SEPARSPHER SI 500 C4 HE	5, 10, 15, 30	Alkyl chain C4 and HE endcapping
SEPARSPHER SI 1000 C4 HE	5, 10, 15, 30	Alkyl chain C4 and HE endcapping
SEPARSPHER SI 100 AMINE	5, 10, 15, 30	Primary amino groups
SEPARSPHER SI 100 DIOL	5, 10, 15, 30	Diol groups
SEPARSPHER SI 200 DIOL	5, 10, 15, 30	Diol groups
SEPARSPHER SI 300 DIOL	5, 10, 15, 30	Diol groups
SEPARSPHER SI 500 DIOL	5, 10, 15, 30	Diol groups
SEPARSPHER SI 1000 DIOL	5, 10, 15, 30	Diol groups

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