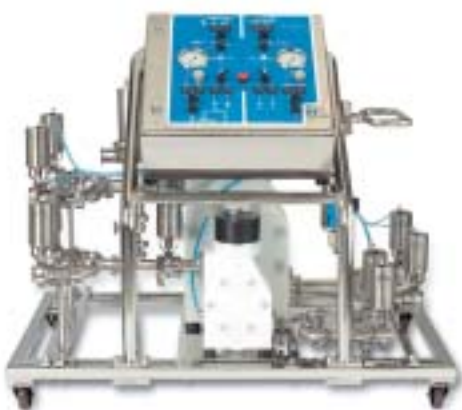




# Resolute™

## Slurry Packing System



### Integrated systems for scalable packing and unpacking of process chromatography columns

Resolute™ slurry packing systems (SPS) are optimised for use with Resolute chromatography columns. With the flexibility of 4 systems in the series, column packing and unpacking can be optimised for one or multiple columns up to 2000mm diameter. The Resolute SPS provides simple control of the column packing and unpacking process within a cGMP environment. The proven design provides scalable packing performance for column diameters from 400mm to 2000mm with most commonly used media types. A range of ancillary equipment integrates all aspects of the packing and unpacking process.

**Convenient packing /  
unpacking**

**Integrated pulse dampener  
improves homogeneity of bed**

**Integrated safety relief valve  
protects column during packing  
process (PED compliance)**

**Compact footprint with  
multi-column operation  
for maximum flexibility**

**Vessel and hose sets  
maximise performance  
and media recovery**

**Validated performance  
for most media types**

### Optimised for Pilot and Manufacturing Operation

To reduce the burden of transferring packing methods during scale up, each system in the series has an output capacity matched to both packing and unpacking flow rates as column diameter is increased. Effective removal of all media from the column during the unpacking process requires increased flow rates compared with packing flow rates. To meet the requirements for all commonly used media types the Resolute SPS series offers packing flow rates from as low as 4L/min and up to 500L/min at 0.5 bar with a maximum pressure limit of 5 bar.

Selecting a suitable model for your process depends upon the column linear velocity, column diameter and media characteristics. An integrated pulse dampener further enhances homogeneity of the packed bed by providing a steady flow of media into the column towards the end of the packing cycle. This, together with the selection of proven system components at all scales, assures reproducible packing conditions at all column diameters and significantly reduces the validation effort during commissioning.

### Compatible with a wide range of Chromatographic Media

Increasingly, new types of chromatographic media with specific packing methods are specified for purification processes now in development. Packing an efficient column requires a comprehensive understanding of the media characteristics as well as a packing system with adequate flow capacity and flow control. Resolute systems deliver excellent performance with a wide range of media types and column configurations including axial compression techniques.

## Superior System Performance

Each Resolute SPS system incorporates two pumps, sized specifically to deliver a wide range of flow rates for optimal packing of all column sizes and media types within the specified performance range. In addition, the system meets the higher flow rates required for effective unpacking of "hard to unpack" media. Depending on the media and linear velocities, multiple column diameters can be packed and unpacked with one system. PTFE lined diaphragm pumps with integral pulse dampeners deliver a smooth and controlled flow of media slurry at high transfer rates. Pneumatically actuated, fast acting control valves provide excellent control during critical stages of the packing process.

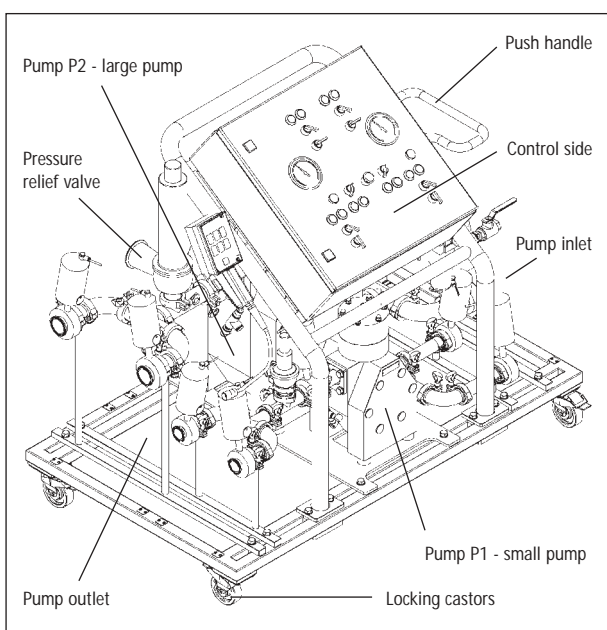


Fig1. SPS M model with optional nozzle control

The innovative use of high performance components and a carefully designed flow path delivers reproducible packing performance. When determining a packing method it is advantageous to monitor packing flow and pressure values. For this purpose, an optional column pressure and flow monitoring kit (PFK) is available. See order information for more details.

The packing and unpacking process is carried out in a closed system to maximise operator safety and process containment. Resolute SPS systems are designed for clean-in-place (CIP) and low maintenance operation.

To comply with European Pressure Equipment Directive (PED) 97/23/EC, the pump manifold includes a safety relief valve to protect the column. This provides a complete and fully functional packing system, without the need for additional components. Alternative vendor systems may require qualification of additional safety components to comply with PED code <sup>(1)</sup>.

## Efficient User-friendly Control Interface

The simple control panel provides:

- Operating controls and parameters in one place
- User-friendly calibration
- Motive air supply regulator for effective pump flow control
- Panel mounted valve selector switch for fluid circuit configuration
- Valve status indicators
- Emergency stop button

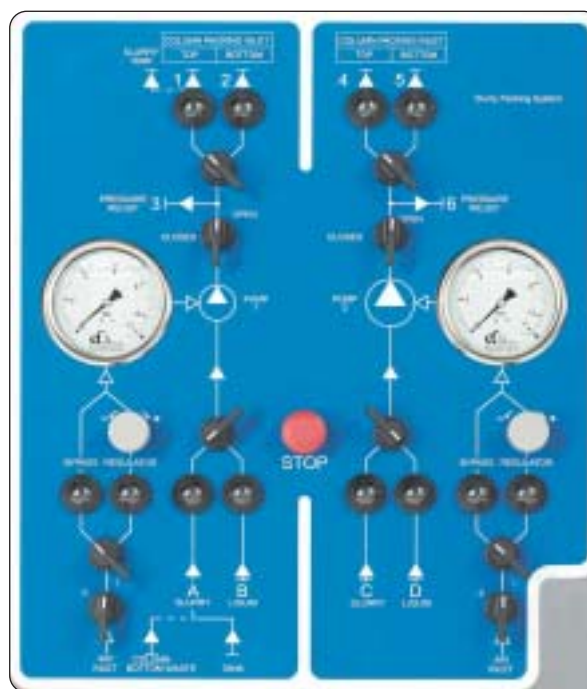


Fig 2. SPS M control interface

<sup>(1)</sup> PED applicable in Europe only

### Cost Effective and Efficient

Following system preparation the actual packing phase completes in less than 10 minutes for any column diameter packed to a bed height of 30cm. Minimum operator attendance is required. Utilisation and recovery of the chromatographic media is assured by excellent process control, low hold up manifolds and a high capacity unpacking pump for complete evacuation of all media from the column. Media storage vessels must also be considered for collection of media during the unpacking phase. The SPS systems effectively evacuate media from the column in a slurry volume equal to 3 column volumes. In addition, for high value media, all slurry material can be transferred into the column to reduce the requirement for additional media for priming purposes.

### System Selection

Using the Packing System Selector chart (Table 1), it is simple to identify a system that best suits your requirements. Resolute packing systems are optimised for both column diameter and maximum packing pressure. Start by identifying the column diameter and the maximum required packing pressure for your chromatography media, and then identify a model that is within the required performance range.

*For operation of multiple column sizes not compatible with one of the system below, please contact your local representative for further assistance*

### Installation and Validation Documentation

The Resolute slurry packing system comes with a comprehensive operator's manual.

The system validation package contains comprehensive protocols and provides the required documentation and procedures to support FAT, IQ and OQ.

### Materials of Construction

The system is constructed from components and process wetted materials suitable for cGMP manufacturing of biotherapeutics.

To support validation efforts and efficient commissioning, the system documentation includes records of the pre-shipment tests results.

System Manual documentation includes:

- Operating Guide
- Materials and compatibility data
- Comprehensive system parts list
- Sub-component manuals
- Spare parts recommendations
- Maintenance recommendations

System	Column Diameter (mm)										Flow Rates L/min	
	280	400	600	800	1000	1200	1400	1600	1800	2000	Minimum at 3 bar	Maximum at 0.5 bar
SP							Maximum Pressure					
SPS-1							3 bar (44psi)				3	107
SPS-2							1 bar (15psi)				10	270
SPS-2E											3	270
SPS-3											18	500
SPS-4											47	500

Table 1. Packing System Selector

## Complete Process Solutions for Column Packing

Each system is supplied ready for connection to a Resolute chromatography column and to optional slurry and buffer tanks of the correct design. Euroflow Transfer Hose and Adaptor Kits provide a simple way of ensuring all terminations are correctly sized and of optimal length to minimize pressure drops and media losses.

For optimum performance and process security, Euroflow also offers a range of compatible slurry and buffer tanks. Slurry tanks include a mixing device to maintain homogeneity of the slurry during packing operations. *For more information refer to ordering section.*

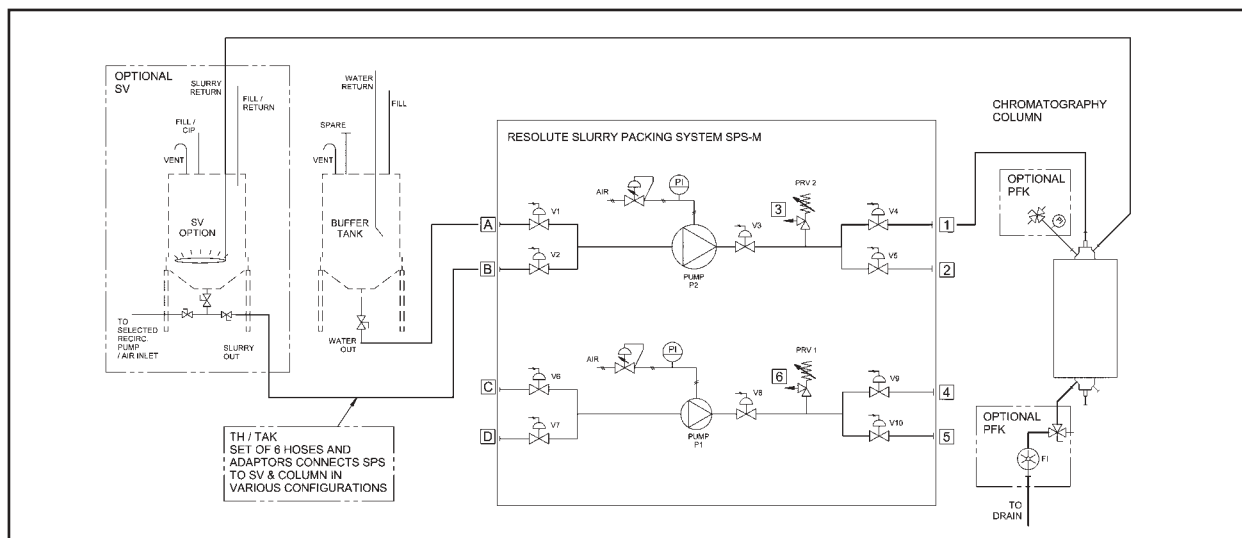


Fig 3. P&ID showing SPS M with optional Pressure/ Flow Kit and auxiliary tanks

## Specifications

Model	SPS-M1	SPSM2 / 2E	SPS M3
Dimensions (lxwxh) mm	1300x875x1259	1300x875x1259	1400x875x1292
Weight	175Kg	200Kg	290Kg
System Capacity L/min @ 3 bar (44psi)	4 - 107	10 - 270 / 4 - 270	18 - 500
Relief Valve setting @Column Operating Pressure: 3 bar (44psi) 5 bar (73psi)		4.0 bar (59psi) 7.0 bar (103psi)	
System Pressure Rating		10 bar (146psi)	
Materials - Process wetted		316L SS, PTFE, EPDM	
Control Panel		Inlet / outlet manifold selector; Valve switches; Status indicators Motive air control; Pressure gauges (bar / psi)	
Utility Requirements: Compressed Air Maximum consumption @ 6 bar (90psi)		Instrument air filtered to 20 micron, -20°C dew point, oil free	
	20scfm	30scfm	40scfm
Terminations: Compressed Air Slurry Relief Valves (2)		1/2" BSP 35mm	3/4" BSP 35 / 73mm

Table 2. SPS M Specifications

## Ordering Information

### Resolute™ Slurry Packing Equipment

#### Slurry Packing System <sup>(1)</sup>

##### Slurry Packing System – Manual

Complete system with pneumatic pumps and valves, pressure dampener and relief valve, manual control panel mounted on mobile stainless steel frame.

Model		Catalog No.
SPS-M1	Min/Max capacity (LPM):3 @ 3bar / 107 @ 0.5 bar)	EBA12A125A99
SPS-M2	Min/Max capacity (LPM):10 @ 3bar / 270 @ 0.5 bar)	EBA12A126A99
SPS-M2E	Min/Max capacity (LPM):3 @ 3bar / 270 @ 0.5 bar)	EBA12A127A99
SPS-M3	Min/Max capacity (LPM):18 @ 3bar / 500 @ 0.5 bar)	EBA12A128A99

Note (1) Requires Transfer Host Set and Transfer Adaptor Kit matched to column size

#### Transfer Hose and Adaptors

##### Transfer Hose Set

Complete sanitary hose set for use with selected SPS model and column. Connects Slurry Packing System (SPS), Slurry Vessel (SV) and Column (includes gaskets and clamps (12)).

TH-1	Hose Kit with 3 meter length hoses (6) and sanitary TC connectors Connects SPS-1 to 400 and 600 mm $\varnothing$ column / Connects SPS-2 to 400, 600, 800 mm $\varnothing$ column	EKA12A126A12
TH-2	Hose Kit with 4 meter length hoses (6) and sanitary TC connectors Connects SPS-2 to 600, 800 and 1000 mm $\varnothing$ column / Connects SPS-2E to 400, 600, 800 and 1000 mm $\varnothing$ column	EKA12A127A12
TH-2	Hose Kit with 4 meter length hoses (6) and sanitary TC connectors Connects SPS-3 to 1000 and 1200 mm $\varnothing$ column	EKA12A128A12

##### Transfer Adaptor Kit

Includes adaptors with clamp and gasket set for specified column size.

TAK-1	Component i.d. suitable for use with 400 mm $\varnothing$ column	EDA11A123A99
TAK-2	Component i.d. suitable for use with 600, 800 and 1000** mm $\varnothing$ columns <sup>(2)</sup>	EDA11A124A99
TAK-3	Component i.d. suitable for use with 1000 and 1200 mm $\varnothing$ columns <sup>(3)</sup>	EDA11A125A99

Note (2) Select TAK-2 for use with 1000 mm column and SPS 2 - Note (3) Select TAK-3 for use with 1000 mm column and SPS 3

#### Packing Support Kits

##### Pressure Gauge and Flow Meter Kit

Includes Bourdon pressure gauge, electronic flow meter, 2 way/ 3-port column valves (2), spool pieces (2), instrument and valve mounting brackets.

PFK-1	Component i.d. suitable for use with 400 mm $\varnothing$ column	EKA14A123A99
PFK-2	Component i.d. suitable for use with 600 mm $\varnothing$ column	EKA14A130A99
PFK-3	Component i.d. suitable for use with 800 mm $\varnothing$ column	EKA14A124A99
PFK-4	Component i.d. suitable for use with 1000 mm $\varnothing$ column	EKA14A131A99
PFK-5	Component i.d. suitable for use with 1200 mm $\varnothing$ column	EKA14A125A99

#### Tanks

##### Media Slurry Tanks

Polypropylene tank with sanitary TC flange process connections, tank isolation valve, vent port, removable lid, CIP spray ring and stainless steel support frame.

SV-1	500 litre nominal capacity	EDA11A123A99
SV-2	1000 litre nominal capacity	EDA11A124A99
SV-3	2000 litre nominal capacity	EDA11A125A99



## Chromatography Columns

### Resolute Standard Columns

- Column diameter from 180mm - 2000mm
- Fixed or adjustable bed height
- Acrylic or stainless steel tubes
- Manual or actuated sanitary pack in place valve

Please refer to publication 016PP for further information



Fig 4. Resolute DM 1000 column

### Engineered Column Solutions

- Operating pressure to 10 bar
- Certification to ASME or PD5500
- Hydraulic actuators for:
  - Positioning of the adjustable piston end cell
  - Axial packing techniques
  - Easier column maintenance

For further information please contact your local representative.



Fig 5. Euroflow 2000mm diameter column

## Distributed exclusively by Pall Corporation

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017PP rev A Printed in England 0403