6. Hints for operation

• Before sample application, we recommend ensuring that no dead volume has occurred at the column inlet during the conditioning phase (see Section 2 for elimination of dead volume).

Protect moistened columns from intense heat and direct sunlight. Heat induces evaporation of highly volatile solutions and the resulting pressure can damage the column.

• **Before storage of the packed column:** Open the sealing stoppers by one complete turn to compensate for temperature-dependent pressure changes. For storage conditions, refer to the instructions of your sorbent supplier.

Resistance

• Chemical and thermal resistance

All solutions used should be filtered through at least 0.45 µm or preferably through 0.2 µm filter membrane.

The following solutions and additives can be used in normal conditions, at pH 1 – 14, working temperature 4 – 40 °C. However, we recommend to use them only for short storage periods.

- Salts in aqueous solution such as NaCl, $(NH_4)_2SO_4$, $MgCl_2$, $CaCl_2$
- 2 M NaOH
- 1 M HCl
- 75 % (v/v) acetic acid
- Detergents (≤ 2 %) such as Triton* X100, SDS
- 6 M guanidine – HCl
- 8 M urea

• Pressure resistance

All Pall LRC laboratory columns are certified to have passed 100% isopropanol pressure test for 15 minutes at following pressures, without leakage:

- Columns of ID 10 : pressure tested to **30 bar (435 psi)**
- Columns of ID 15 : pressure tested to **25 bar (360 psi)**
- Columns of ID 25 : pressure tested to **15 bar (215 psi)**
- Columns of ID 50 : pressure tested to **10 bar (145 psi)**

Cleaning

See Section 5. Suitable cleaning agents are soapy water or laboratory detergents.

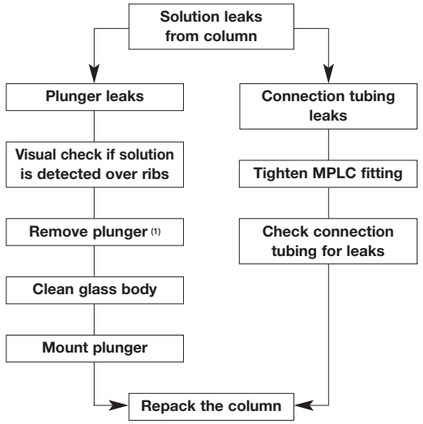
For packed columns, please refer to the cleaning instructions of your sorbent supplier.

Ordering Information

See Table III.

Troubleshooting

Situation	Possible cause	Remedy
1. Peak shape of eluted substances deteriorates	**1.** Dead volume at the column inlet.	See Elimination of dead volume in Section 2.
	2. Inlet frit partially clogged.	Remove and dismantle variable plunger, replace frit, reassemble and re-insert plunger. Recondition the column.
	3. Outlet frit partially clogged.	Remove plunger, replace frit, reassemble and re-insert plunger. Recondition the column.
	4. Separation efficiency of stationary phase changed due to contamination.	Repack the column.
	5. Stationary phase mechanically damaged.	Repack the column.
2. Air in the column	Gas evolution or solution evaporation during storage.	Repack the column.
3. Abnormal pressure increase during operation	**1.** Incorrect valve position.	Check valve position.
	2. Clogged frit.	See Section 3 on frit replacement.
	3. Fittings tightened too strongly.	Replace fittings and ferrules, cut damaged tubing.
4. Pressure drop during operation	**1.** Line or fitting between pump and column leaks.	Check lines and connections.
	2. Solution supply empty.	Refill solution.
5. Solution leaks from column	See diagram below.	See diagram below.



(1) ***CAUTION:*** *Open connection tubing first to prevent cracking of the packing due to vacuum originated by removal of the piston.*

PALL Life Sciences

New York - USA
+1 516.484.5400 phone
+1 516.801.9548 fax
biotech@pall.com

Portsmouth - UK
+44 (0)23 9230 3303 phone
+44 (0)23 9230 3520 fax
BioPharmUK@europe.pall.com

Cergy - France
+33 (0)1 34 20 78 00 phone
+33 (0)1 34 20 78 78 fax
bioseprainfo@pall.com

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Revised 07/2009

USER GUIDE

LRC Laboratory Columns

Chromatography Columns for Laboratory Applications

Pall® LRC Laboratory Columns

Description

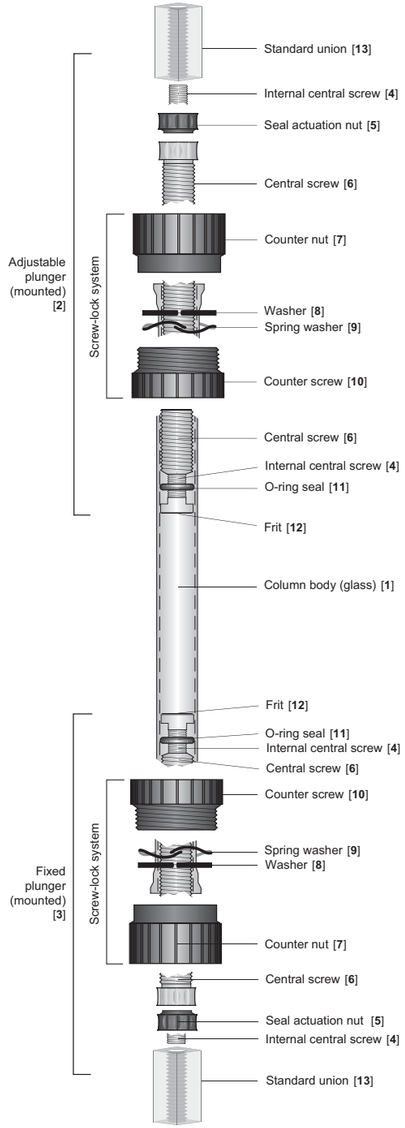
Pall® LRC chromatography columns have been designed to meet the requirements of most laboratory applications (ion exchange, affinity, size exclusion, mixed-mode chromatography). Four internal diameters from 10 to 50 mm and four lengths provide a range of column volumes up to 900 mL and bed heights up to 750 mm. Each column is supplied assembled and ready-to-use, with tubing and fittings for connection to a standard system. The column body is made of a borosilicate glass tube. The columns are equipped with one adjustable and one fixed plunger, and a screw-lock system, to allow a rapid adjustment of the plunger (see detailed diagram on Page 2).

Main benefits

• **Robust design**
- Robust inlet and outlet connections made at the exterior of the column provide a more reliable and visible connection.
- Linear motion of plunger avoids torsional load on the packed bed and assures true linear compression.
- True frits pressed into the plunger assure even flow distribution across the bed.

• **Easy-to-use**
- Screw-lock system allows a rapid adjustment of the plunger.
- Compatible with any liquid chromatography system due to standard fittings 1/4 – 28.
- Easy open ends: Easily removable threaded end fittings make column disassembly effortless.
- Easy adjustment of O-ring seals.

• **Capability**
- One single adjustable piston provides up to 120 mm bed height adjustment.
- Pressure limit: 10 – 30 bar (145 – 435 psi) (See Table III)
- Temperature range: 4 – 40 °C.



Detail of a Pall LRC Column

USD 2482a - Rev. 07/2009

Table I. Column components and materials of construction

Description	Material of construction
Column body [1]	Borosilicate glass
Plungers: 1 adjustable [2] and 1 fixed [3] Each with:	
- Internal central screw [4]	POM (a)
- Seal actuation nut [5]	POM
- Central screw [6]	POM
- Counter nuts [7] and screw [10]	POM
- Washer [8]	POM
- Spring washer [9]	Steel
- O-ring seal [11]	FPM (b)
- 10 µm frit (pressed into column plunger) [12]	Sintered glass
- Standard union (1/4 – 28 both sides) [13] (c)	Polypropylene

Table II. Parts included in column package

Quantity	Description	Material of construction
2	Fitting (ferrule with nut)	POM and Tefzel*
1	Connection tubing (1/16" or 1/8" OD)	FEP (d)
1	Frit ejector	POM and steel
1	User Guide No. USD 2482	–

(a) POM : Polyoxymethylene, or acetal
(b) Fluoroelastomer polymer
(c) Only on columns of ID 10 and 15 mm
(d) Fluorinated ethylene propylene

Instructions for use

LRC columns are supplied assembled and ready-to-use, with tubings, fittings and connections. Unpack the column carefully and check that no component is missing or damaged.

1. Dismantling and reassembling the plunger

LRC columns are equipped with a screw-lock system which can be easily dismounted by unscrewing the counter nut [7] from the counter screw [10].

Before opening the column lock: Loosen the seal actuation nut [5] until the O-ring seal [11] is released from the column body [1]. The counter nut [7] can then be extracted from the column end together with the plunger [2 and/or 3].

For reassembling: Gently insert the plunger [2 and/or 3], with the counter nut [7] attached, into the column body [1], ensuring that it goes in straight and not at an angle. Bring the counter screw [10] and the counter nut [7] into position by turning them in opposite directions.

During assembly step, care should be taken that the inner glass surface is absolutely particle-free to prevent any damage to the plunger O-ring seals [11].

Table III. Specifications and Ordering Information

Cat. No.	Description	ID (mm)	Equipped with 1 adjustable plunger Bed height (mm) min – max	Equipped with 1 adjustable plunger Volume (mL) min – max	Equipped with 2 adjustable plungers Bed height (mm) min – max	Equipped with 2 adjustable plungers Volume (mL) min – max	Maximum pressure tested (bar)	Maximum pressure tested (psi)
LRC10x000-120V01	LRC Column 10/0-120	10	**0 – 120**	**0 – 9**	**0 – 120**	**0 – 9**	30	435
LRC10x080-200V01	LRC Column 10/80-200	10	**80 – 200**	**6 – 16**	**0 – 200**	**0 – 16**	30	435
LRC10x330-450V01	LRC Column 10/330-450	10	**330 – 450**	**26 – 35**	**210 – 450**	**17 – 35**	30	435
LRC15x080-200V01	LRC Column 15/80-200	15	**80 – 200**	**14 – 35**	**0 – 200**	**0 – 35**	25	360
LRC15x330-450V01	LRC Column 15/330-450	15	**330 – 450**	**58 – 80**	**210 – 450**	**37 – 80**	25	360
LRC15x630-750V01	LRC Column 15/630-750	15	**630 – 750**	**111 – 133**	**510 – 750**	**90 – 133**	25	360
LRC25x080-200V01	LRC Column 25/80-200	25	**80 – 200**	**39 – 98**	**0 – 200**	**0 – 98**	15	215
LRC25x330-450V01	LRC Column 25/330-450	25	**330 – 450**	**162 – 221**	**210 – 450**	**103 – 221**	15	215
LRC25x630-750V01	LRC Column 25/630-750	25	**630 – 750**	**309 – 368**	**510 – 750**	**250 – 368**	15	215
LRC50x080-200V01	LRC Column 50/80-200	50	**80 – 200**	**157 – 393**	**0 – 200**	**0 – 393**	10	145
LRC50x330-450V01	LRC Column 50/330-450	50	**330 – 450**	**648 – 884**	**210 – 450**	**412 – 884**	10	145

LRC10 KITV01	LRC Spare Part Kit(1) for Column ID10
LRC15 KITV01	LRC Spare Part Kit(1) for Column ID15
LRC25 KITV01	LRC Spare Part Kit(1) for Column ID25
LRC50 KITV01	LRC Spare Part Kit(1) for Column ID50

(1) One spare kit includes: 4 O-rings, 4 frits of 10 µm, 1 m tubing
Reservoirs (column coupler and spare glass tube) are available on request. Please refer to Pall User Guides No. USD 2498 and USD 2499.

2. Adjustment of the plunger

If a headspace is visible at the top surface of the bed height, the dead volume can be easily eliminated as follows, without requiring to open the column:

- Turn off the pump
- Turn the screw-lock system counterclockwise

3. Frit replacement

Using the frit ejector included in the column package, eject the old frit [12] through the plunger hole [2 and/or 3], and replace it by a new one.

4. Connecting the column to a system

The columns have a built-in thread for 1/4 – 28 fitting, to allow direct connection to a standard system.

- Systems equipped with 1/4 – 28 connections

- 10 and 15 ID columns: Connect the 1/4 – 28 connection to the standard union [13].
- 25 and 50 ID columns: Connect it directly to the internal central screw [4].

- Systems equipped with M6 connections

Use a 1/4 – 28 internal to M6 internal adapter (not supplied).

- Systems equipped with 10 – 32 connections

Use a 1/4 – 28 internal to 10 – 32 internal adapter (not supplied).

5. First-time use

The plungers [2 and/or 3], frits [12] and column body [1] must be cleaned carefully before first use and any new packing. In some cases, it might be worth dismantling the column and washing the parts in a sonic bath for several minutes. After cleaning, all parts must be rinsed with distilled water and assembled as described in Section 1. All parts must be free of dust and particles. Be sure that the plungers [2 and/or 3] are inserted carefully into the column body [1]; if not introduced axially, the plunger seals [11] might be damaged.

To operate the column, it must be connected to an appropriate chromatography system or pump. Choose tubing according to the nature of solutions and flow rates to be applied on the LRC column.

We recommend operating the column from the top (adjustable plunger [2]) to the bottom (fixed plunger [3]).

If the column bed shrinks, the dead volume can easily be eliminated by moving down the adjustable plunger (see instructions in Section 2).

- Use only degassed and prefiltered solutions to operate the column because particles may clog the frits and compromise column packing.
- Make sure that the particle size of the chromatography material correlates with the 10 µm porosity of the frit.