

Core | **Vessels**

Operating Guidelines EV and EVK series v1.1

Author: Dr J Tunstall

SciMEDTM
 Core Separations

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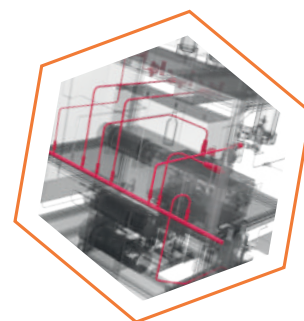
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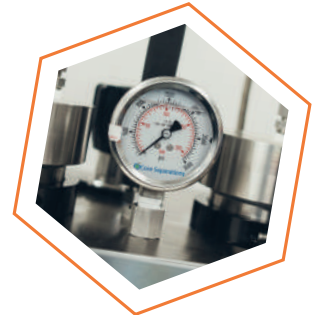
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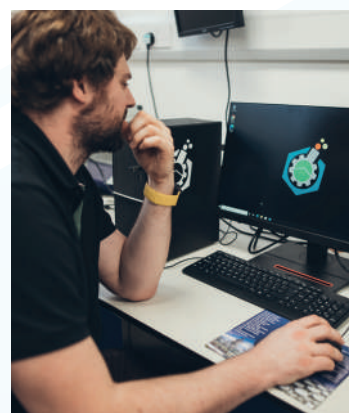
01. Supercritical Fluids

At Core Separations we specialise in Supercritical Fluid Extraction (SFE), which is commonly used to extract compounds from solid botanical material. Supercritical CO₂ is predominately used for these extractions, due to its achievable pressure and low temperature (critical temperature and pressure of 31 °C and 74 bar.). The CO₂ can be further modified using a co-solvent (usually methanol or ethanol) to help change the polarity of the mobile phase.

Supercritical Fluid Extraction can separate and fractionate components according to polarity, log P (the ratio of concentrations of a compound in the two phases of a mixture of two immiscible solvents at equilibrium), and molecular weight. These properties render Supercritical Fluid Extraction predictable and scalable from analytical to process applications. When using a high-pressure separator, such as the ones provided with a Core Separations SFE system, you can manipulate the pressure and temperature of the supercritical CO₂, in order to selectively extract and collect the desired material.

These are examples of frequently used applications of bulk-scale Supercritical Fluid Extraction:

- Extraction of liquids and materials from a solid or semisolid sample (for example, tea extracts and nut-oil extracts).
- Extraction processes isolating food and botanical compounds that require a clean and safe extraction process, which does not leave any residual materials in the collected product.



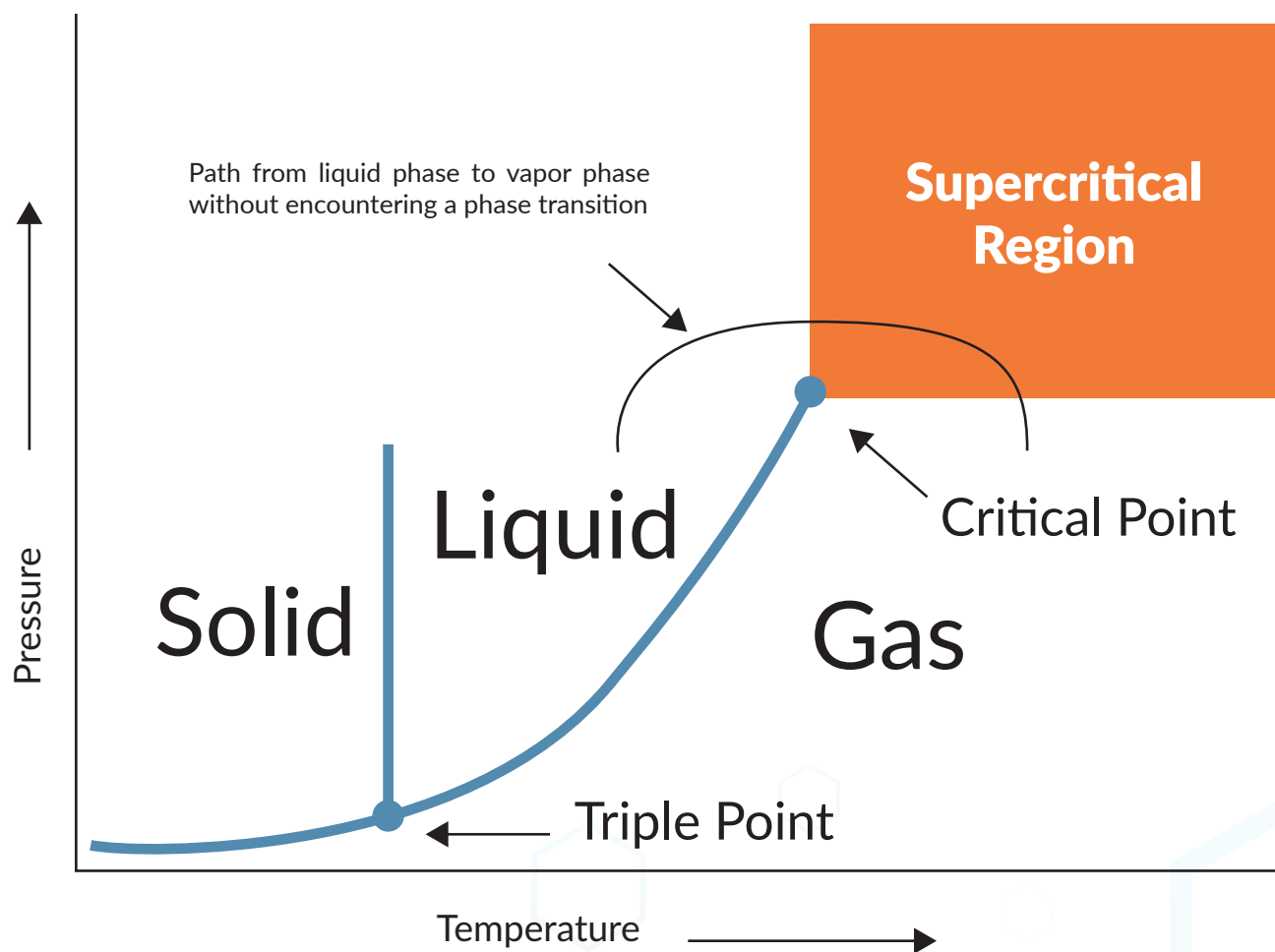


Figure 1-1: Supercritical CO₂ is tuneable without changing phases

During extraction and collection, by raising the pressure of the supercritical CO₂ flow in the system, it is possible to increase a system's capability to extract polar compounds. Adding a co-solvent, such as ethanol, additionally increases this capability to collect more polar compounds.

02. Introduction

The Core Separations high pressure vessels are designed for use in any application where CO₂ is used for either reaction or extraction. All wetted parts are 316 stainless steel and/or 17-4PH stainless steel, with PTFE graphite seals as standard.

Pressure Range
0-10,000 psi


Pressure Range
0-14,500 psi



Ensure the correct fittings are used on the correct vessels.

2.1. EC Mark and Certification - Declaration of Conformity

The Core Separations extraction and reaction vessels described in this manual are manufactured in compliance with Directive 2014/68/CE.

Core Separations		SciMED
EU Declaration of Conformity		
Manufacturer: SciMed, Ltd Unit B4, The Embankment Business Park Vale Road Heaton Mersey SK4 3GN United Kingdom		
Type of Equipment: Industrial, Scientific and Medical Laboratory Equipment, (ISM) Supercritical Fluid Extraction		
System Assembly - 2020-02		
Notified Body: SGS United Kingdom Ltd, station Road, Oldbury, West midlands, B69 4LN PED Conformity Assessment Modules: G (SGS cert -) Design Standard/s Applied: ASME Sec VIII Div 1		
SciMed Ltd hereby declares that the device(s) mentioned above comply with: 2014/35/EU Low Voltage Directive 2014/30/EU Electromagnetic Compatibility Directive 2014/68/EU The Pressure Equipment Directive (PED)		
Product standards used for demonstration of compliance: EN 61010-1:2010 Safety requirements for electrical equipment for measurement, control and laboratory use. General requirements. EN 61010-2-010:2014 Particular requirements for laboratory equipment for the and laboratory use for the heating materials EN 61326-1:2013 Electrical equipment measurement, control and laboratory use. EMC requirements. General requirements EN 50581:2012 Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances		
 James Tunstall - Product Manager	August 06, 2020 Date	
SciMed Unit B4, The Embankment Business Park, Vale Road, Stockport, SK43GN Phone: 0161 442 9963 E-Mail: enquires@scimed.co.uk CSXXX-Rev1.0		

2.2. Guarantee

Core Separations products are under warranty from:

1. Defects in their construction and materials for a period of (1) year from the time they left the factory.
2. This guarantee is limited to the repair and replacement of parts or products that Core Separations deems were defective at the time of delivery.
3. All the products covered by this limited guarantee must be returned freight paid for inspection, repair, or replacement by the manufacturer.
4. This limited warranty is the only form of valid guarantee and replaces any other form of explicit or implicit warranty, including any guarantee of fitness for sale or any particular purpose.
5. The manufacturer refuses any such liability with this statement.
6. Faulty products will only be repaired or replaced according to these terms. Core Separations is not liable for any further loss, damage, or expense, including accidental or indirect damages caused directly or indirectly from the sale or use of these products.
7. Any unauthorised use of spare parts that were not manufactured by Core Separations automatically invalidates this guarantee, which is subject to compliance with the instructions for installation and operation provided. There are no additional guarantees other than the guarantee described above.

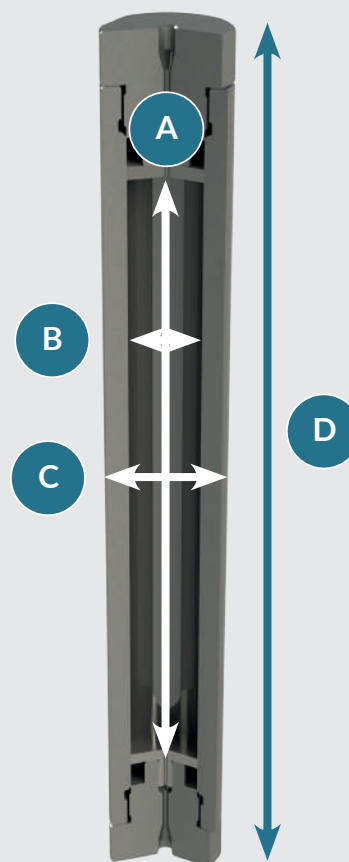


2.3. Technical Characteristics

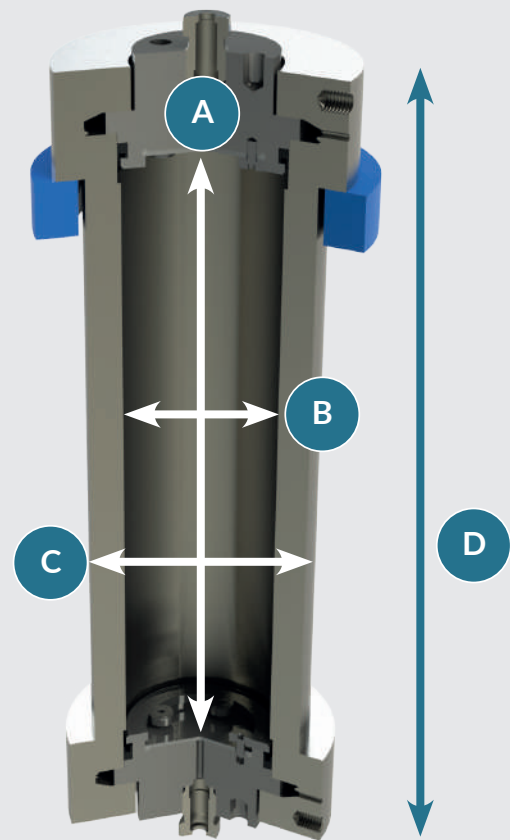
The main dimensions and specifications for the Core Vessels are as follows:

Model	Volume (mL)	A (inch)	B (inch)	C (inch)	D (inch)
EV5	12	1.627	0.781	1.25	3.627
EV10	17	2.254	0.781	1.25	4.254
EV25	32	4.13	0.781	1.25	6.13
EV50	57	7.27	0.781	1.25	9.27
EV500	741	6.4	3	4.25	10.15
EV1L	1355	11.7	3	4.25	15.45
EV5L	6513	28.02	4.25	6	31.77
EV10L	9884	42.52	4.25	6	47.27
EVK1L	2010	8.65	4.25	6.875	18.251

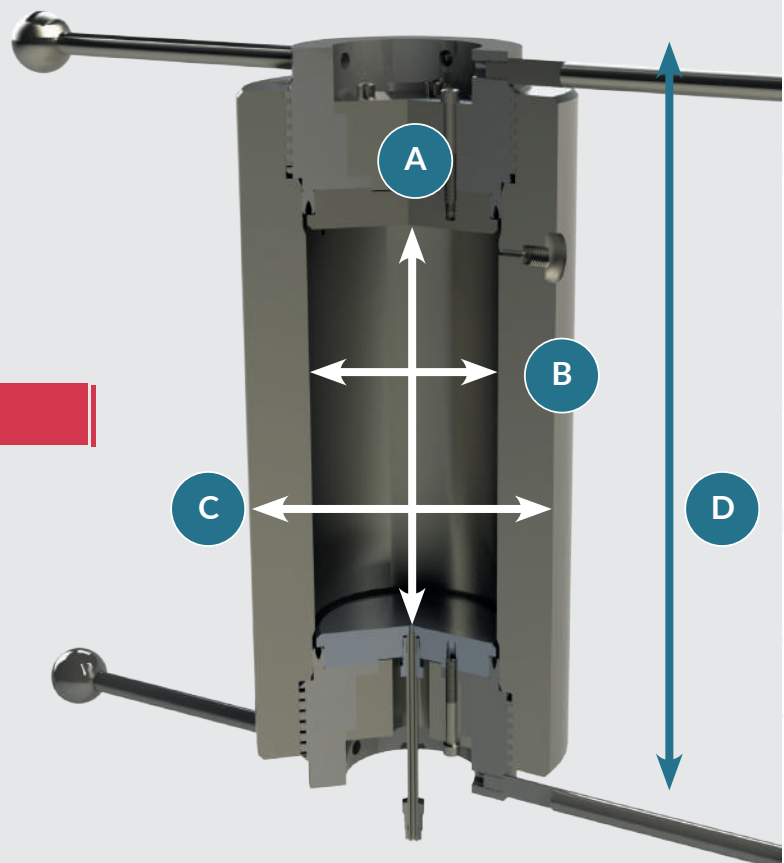
EV Series Vessel (5 mL- 50 mL)



EV Series Vessel (500 mL- 10L)



EVK Series Vessel



2.4. Local Conditions

The EV and EVK SERIES vessels should be stored and operated within the following conditions:

Parameter	Tolerated Values
Room Temperature	From -10 °C to + 50 °C
Storage Temperature	From 0 °C to +50 °C
Humidity	From 20 % to 80 %



The high-pressure vessels described in this manual are not designed for operation in potentially explosive environments.

2.5. Power Requirements - Electric Jackets

The vessels do not require power, but are often provided with electrical heater bands. The power can vary from vessel to vessel depending on the conditions required. The standard jackets that can be provided with each vessel are described below:

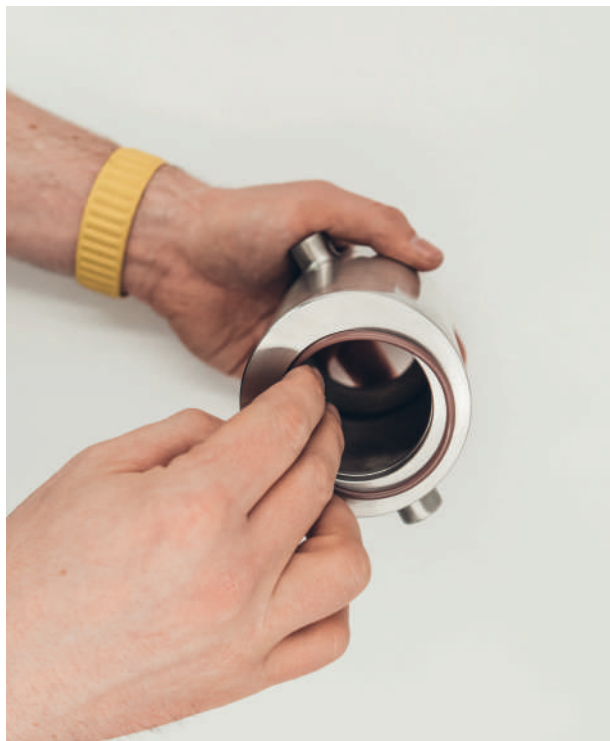
Vessel	Heater P/N	Input Power	KW
EV500SP	HJ425x31KWCEST	415V	1
EV1L	HJ425X81KWCE-4	415 V	1
EV1LSP	HJ425X651KWCEST	415 V	1
EV5L	HJ6X18W2KWCE-4	415V	2
EV10L	Contact Core Separations for options		
EVK1L	BH65X95WX	415V	2

2.6. Liquid Jackets

All Core Separations vessels can be fitted with a liquid jacket. The liquid jacket allows the vessel to be cooled as well as heated using a closed loop circulator. These sleeves slide onto the body of the vessel and seal on the two O-rings located at the top and bottom of the jacket.



Step 1 - Unpack liquid jacket



Step 2 - Install O-ring into the top recess of the jacket



Step 3 - Repeat step 2 and install an O-ring into the lower recess of the liquid jacket.



Step 4 - Slide jacket over the vessel body. It is advisable to use O-ring grease, on both the body and O-ring to ensure the O-ring slides effortlessly over the body.

03. Safety

3.1. User Responsibilities

The ultimate responsibility for the safe operation of this vessel is with the user. The pressure and temperature limits of the vessel **MUST** be observed and no attempt to increase these limits should be carried out.

Installation of the vessel **MUST**:

1. Include the use of appropriate safety accessories. If these are provided, they **MUST** be installed in accordance with the instructions provided by the manufacturer.
2. The safety accessory **MUST** be directed into a safe area.
3. The vessel **MUST** be appropriately mounted and immobilised before use.
4. The vessel **MUST** be installed in a well-ventilated lab.

When operating the vessel, the user **MUST**:

1. Inspect the equipment and check that it is in good working order.
2. Ensure all users are adequately trained to use the equipment.
3. Ensure the system alarm limits are **NOT** altered to prevent over pressurisation.

3.2. Unpacking the Vessel

The vessels are supplied with or without a stand. Depending on the vessel, care **MUST** be taken when unpacking as the vessels can be heavy and can cause damage to the user if dropped.



Installation of the vessel after transport

3.3. Installation

The vessel must be installed in a well ventilated space. This is important if using a supercritical fluid such as carbon dioxide. Uncontrolled release of the CO₂ into a room could cause asphyxiation.

The area and environment that the high-pressure vessel operates in must be clearly signposted and prohibited to unauthorised personnel. Prior to using the vessel, the operator or operators are required to check:

1. The vessel pipework is correctly installed .
2. The electrical parts, such as a heater band, are correctly installed.
3. The high-pressure pipe and fittings do not exhibit signs of abrasion or excessive wear. Any defect, damage or reasonable doubt that might arise before or during the operation must be reported and verified by qualified staff. Should this happen, the system must be stopped immediately, and the pressure brought down to zero.

Vessel should be located close to:

1. Laboratory hoods
2. Exhaust fans
3. Safe outside space

Installation must also include provisions for when a safety device is activated:

1. Installation of pipework directed to a safe discharge area.
2. Appropriate ear protection in case of rupture disk activation. Especially for operators standing near the vessel.



Do not attempt to remove or alter any part of the vessel, unless instructed in this manual. No unauthorised personnel should tamper with the equipment without contacting the manufacturer first.

3.4. Fittings

The fittings used to connect the inlet and outlet of the vessels depend on the model and maximum pressure. The vessels have been machined using dimensions provided by the manufacturer. Interchanging fittings with other manufacturers is not recommend. We recommend the use of Swagelok (or equivalent) for creating the interconnecting pipework

Model	Inlet / Outlet	Side Port
EV5 - EV50	1/16th Valco Port	N/A
EV100 - EV10 L	HIP - AF4 (Tapered Fitting)	1/4 NPT
EVK1L	1/4 M/P (Cone and Thread) Autoclave Engineer	1/4 M/P

Swagelok Guidelines

<https://www.swagelok.com/downloads/webcatalogs/en/ms-13-151.pdf>

HIP

<https://www.highpressure.com/products/valves-fittings-tubing/taper-seal-valves-fittingsand-tubing/assembly-procedure/>

Autoclave Engineer (Parker)

http://www.autoclave.com/aefc_pdfs/FT_MedPress.pdf

VICI Valco

<https://www.vici.com/support/tn/tn503.pdf>

3.5. Maintenance and training

It is the responsibility of the user to keep the equipment in good condition. Serious consequences can result from poor maintenance and mis-operation of these pressure vessels. Frequent checks should be carried out ensuring the equipment is free from:

1. Cracks
2. Corrosion
3. Bulging in the outer wall

If any of these are observed, stop using the vessels immediately and contact a Core engineer for advice and further analysis.

We also recommend that all users familiarise themselves with the fittings manual provided by the manufacturers and follow their instructions when assembling the pipe work.

3.6. Personal Protective Equipment (PPE)

As part of the training procedure, we recommend the use of the following PPE when operating the vessel and these items should be included in any operating instructions, if the vessel is incorporated into an assembly.



Wear Safety Googles



Wear Gloves

3.7. Product Labels

An exact description of the equipment, serial number, and technical data is included on the pressure vessel body. This allows technical personnel to quick identify the equipment. **The identification data is fibre lasered to the equipment, as shown below:**



Under no circumstances should labels be removed from the equipment.

04. Pipework

4.1. Making Pipework



Before installing ensure the high-pressure pipe has been correctly made!

Core Separations use a variety of widely available high-pressure fittings (HIP, Autoclave Engineer and Swagelok). It is the user's responsibility to be familiar with the installation and removal of these fittings before attempting to install the vessel. Manufacturer guidelines for the correct operation of these fittings are found here:

Swagelok Guidelines

<https://www.swagelok.com/downloads/webcatalogs/en/ms-13-151.pdf>

HIP

<https://www.highpressure.com/products/valves-fittings-tubing/taper-seal-valves-fittingsand-tubing/assembly-procedure/>

Autoclave Engineer

http://www.autoclave.com/ae/c_pdfs/Tools.pdf

VICI - Valco

<https://www.vici.com/support/tn/tn503.pdf>



It is important to distinguish the differences between the different types of fittings. and use the correct installation instructions.

We advise the use of Swagelok high pressure fittings (and equivalents) to make the interconnecting pipes for the EV series vessels (not the EVK). Formation and tightening of these fittings DOES NOT require a torque wrench. Manufacturer instructions should be followed to prevent incorrect installation of these fittings. If in doubt, please contact a Core Separation engineer for advice.

4.1.1 Making Pipework - EV5-50

EV series vessels up to 50 mL are machined to accept a 1/16" VICI fittings (valco). When creating new pipe-work please follow the instruction provided by the manufacturer (See 4.1).

Fitting Type	Typical Locations	Torque Setting
ZN1-10 (1/16")	Inlet and Outlet	1/4 Turn



The fittings are installed in the inlet and outlet port's located on the vessel caps, by first hand tightening the fitting into the port. The fitting can then be tightened using a 1/4" spanner and turning the fitting by 1/4 of a turn until tight.

4.1.2 Making Pipework - EV100 - 10L

EV series vessels ranging from 100mL to 10L are machined to accept a 1/4" HIP tapered fitting (HIP). When creating new pipework please follow the instruction provided by the manufacturer (See 4.1).

The HIP fittings used can be tightened using the following torque settings:

Fitting Type	Typical Locations	Torque Setting
AF4 (1/4")	Inlet and Outlet	Initial Compression – 30 ft/lb Tighten Connection – 50ft/lb



The fittings are installed in the inlet and outlet port's located on the vessel caps, by first hand tightening the fitting into the port. The fitting can then be tightened using a 13/16" spanner or torque wrench, while bracing the cap with the pin spanner provided. The fitting should be tighten to 50ft/lbs.

4.1.2 Making Pipework - EVK1L

EVK series vessels are machined to accept a 1/4" medium pressure fittings (Autoclave Engineer). When creating new pipework, please follow the instructions provided by the manufacturer (See 4.1).

The autoclave medium pressure fittings can be installed using the following torque settings:

Fitting Type	Typical Locations	Torque Setting
SF250CX (1/4")	Inlet and Outlet	Initial Compression – 10 ft/lb



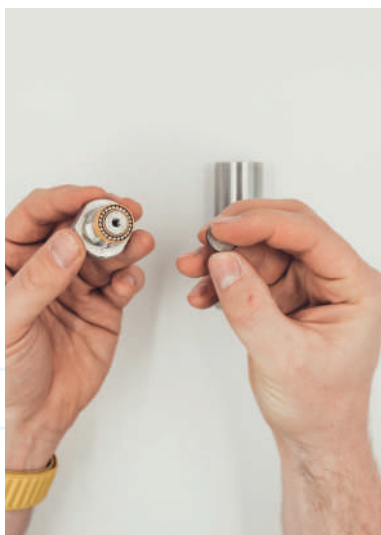
The fittings are installed in the inlet located on the head, with the outlet located in the side of the body. When installing the fitting ensure the gland nut is on the tubing followed by the collar. Turn the collar counterclockwise until 1-1/2 to 2 full threads are exposed between collar and cone before installing the pipework.

05. Assembly

5.1. Assembly EV5 - EV50

Used in the Core | ESS system, these vessels have a single part thread cap. Assembly and/or disassembly, whether they are 5 mL or 50 mL vessel is identical and is described below. Assembly of the vessel does not require tools, although attaching the pipework requires a 1/4" spanner.

1	To assemble the lid onto the vessel, first ensure the sealing surface on the inside of the vessel is clean and free from debris.
2	Before installing the lid, ensure the seal is fitted and undamaged and the filter is installed.
3	Turn the lid clockwise, there will be resistance caused by the energised seal. <i>Note: Try installing the cap, square to the body to avoid damaging the seal.</i>



Step 2a - Install the filter holder



Step 2b - Place cap into main body



Step 3 - Turn cap clockwise until it bottoms out on the body

5.2. Assembly EV100 - EV10 L

Commonly used in the Core | Extraction and Core | Reaction range, these vessels have a 2-part lid design. Assembly and/or disassembly, whether they are 500 mL or 10 L vessels is identical and described below. The tools described can be used for all vessels in this range.

1	To assemble the lid onto the vessel, first ensure the sealing surface on the inside of the vessel is clean and free from debris.
2	Install the inner cap by pressing the cap into the main body. There will be resistance caused by the energised seal. <i>Note: Try installing the cap, square to the body to avoid damaging the seal.</i>
3	Before installing the outer lid, ensure the threads on the body are free from dirt and debris and apply an appropriate grease or dry lubricant to the threads in-order to avoid gauging.
4	Place the outer lid over the cap and turn the lid anti-clockwise until the lid bottoms out. <i>Note: The pressure vessels are provided with bars to aid in tightening the lid.</i>



Step 1 - Check sealing surface



Step 2 - Place cap into main body



Step 3 - Apply Lubricant



Step 4 - Install lid

5.3. Assembly EVK1L

Used in the Core ultra high-pressure systems, these vessels have a multi part cap design. Unlike the other vessels in the Core Separation range, the outlet is not in the head, but exits *via* the side wall in one of the 4 side ports. The inlet remains in the head, however the pipe work must be assembled before building and installing the head (see 4.1).

1	Before assembling the head, ensure all the parts are present; outer lid, brass cap, brass ring and seal retainer.
2	Ensure the seal is in place on the seal retainer with the spring facing towards the lip. Align the holes on the brass ring to match the seal retainer holes.
3	Place the brass cap into the centre of the outer lid. <i>Note: we recommend the brass cap is placed on a flat surface and the outer cap is pressed over it.</i>
4	The outer cap and brass cap are placed onto the brass ring ensuring it aligns to the bolt holes.
5	The 3/16" cap head bolts can then be added and tightened to fix the head together. <i>Note: apply a small amount of lubricant to the end of the bolt threads to prevent the bolts from binding.</i>



Step 2a - Ensure the seal is installed



Step 2b - Place brass ring on seal retainer



Step 3 - Install the brass cap into the outer lid



Step 5 - Tighten the 3/16" cap head bolts to fix the head together

5.3.1. Assembly EVK1L Pipework

Unlike the EV series vessels, where the pipework can be assembled and removed without disassembling the vessel head, the EVK vessels require the pipework to be assembled before building the head.



Once the head is disassembled (see 5.5 Assembly of EVK1L for instructions), the inlet port can be accessed. The port has been designed to accept a 1/4" medium pressure fitting (See 4. Pipework). We recommend a short stem is installed in the inlet, which can be used as a way to connect the vessel to the rest of the pipework.



Step 1 - Install the cone and thread fitting as per the manufacturers instructions (autoclave engineer)



Step 2 - Reassemble the head



06 • Servicing

6.1. Servicing the Seals - EV5 - EV50

These compact vessels are used in small scale development or analytical work. Commonly provided with our Core | ESS, servicing these vessels is easy and toolless.

1	Before servicing these vessels, ensure the vessel is depressurised before removing the pipework.
2	To remove the head, first turn the cap counterclockwise
3	If a filter is installed, remove this by turning it counterclockwise to reveal the sprung seal.
4	To remove the seal pull it towards you. For re-assembly, follow the instruction in reverse.



Replace check valve



Step 2a - Remove head by turning Counterclockwise



Step 2b - Remove head



Step 3 - Remove filter assembly

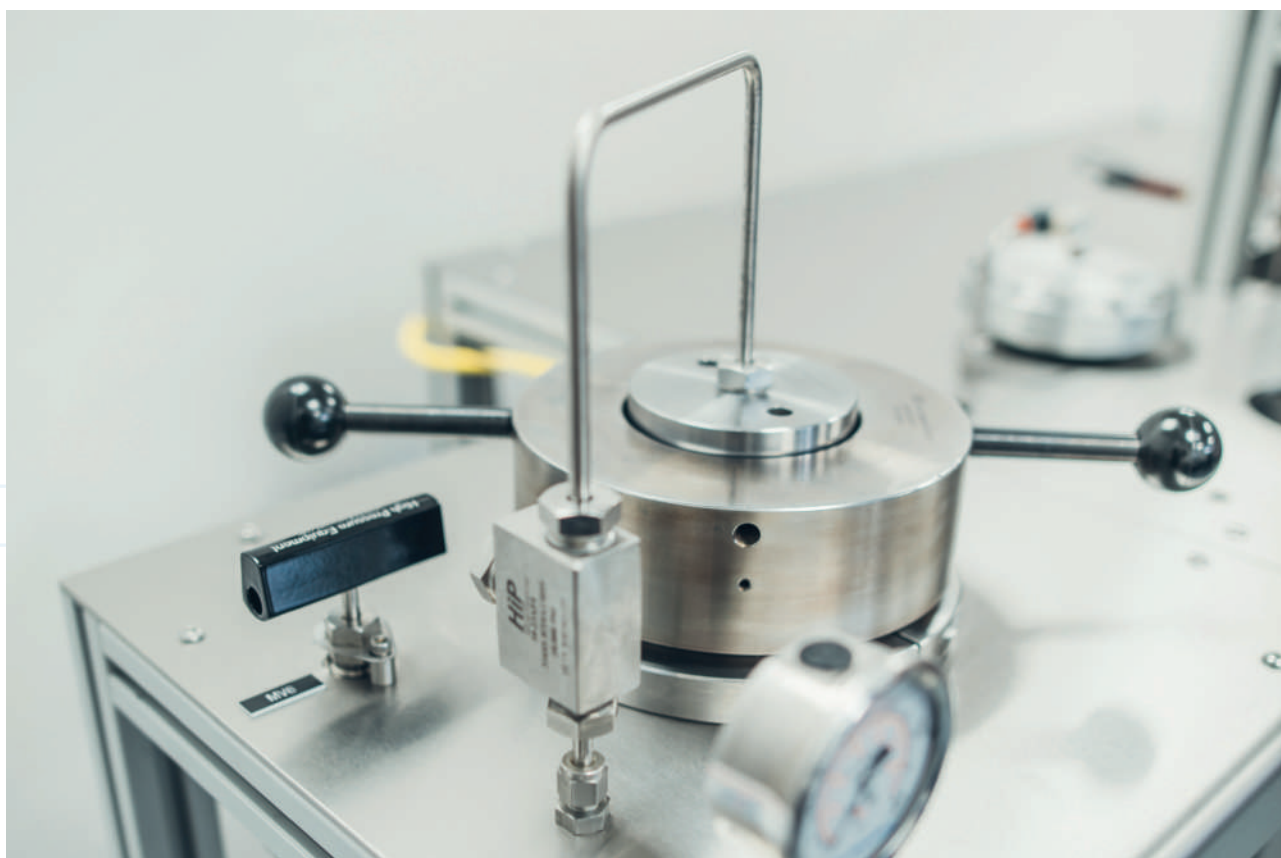


Step 4 - Remove seal

6.2. Servicing the Seals - EV100 - EV10L

When starting any service, ensure the vessels are fully depressurised before removing the pipework (See pipework). Seals can be changed as a preventative measure, or when a seal has become damaged/worn. To determine whether a seal has become damaged or become worn, the side wall of the outer cap contains a hole 1/4", usually located below one of the threaded holes. This "weep hole" indicates when gas is passing the seal, and that the seal is damaged or worn and requires replacement.

1	Using the lid bars provided, unscrew the vessel cap by turning counterclockwise on the vessel. <i>Note - There are four holes in the side of the outer cap to help unscrew the vessel.</i>
2	Once the outer lid is removed, lift the inner cap from the vessel. There may be resistances due to the energised sprung seal.
3	To remove the energised sprung seal, the filter retaining plate must be removed. This can be removed using a 1/8" Allen key.
4	Once the plate has been removed, the energised seal can be removed by pulling it towards you.
5	To add a new seal, ensure the spring of the seal is installed facing the inside of the vessel.



Lid bars for the EV Series Vessel lid



Step 1 - Remove lid by turning counterclockwise



Step 2 - Remove inner cap



Step 3 - Remove filter retaining plate



Step 4 - Remove energised seal



Take care not to damage the seal when re-installing the cap.
Scratching of the seal, this cause seals to leak prematurely.

6.2.1. Servicing the Filter Plates - EV100 - EV10L

The filter plates are used to retain the biomass within the vessel. These can be removed, cleaned and/or replaced with a new filter plate to ensure the CO₂ passes freely through the vessel. Different porosity plates can be used and the operation to remove them is described below:

1	Once the cap has been removed, the filter plate can be replaced or cleaned. First remove the filter retaining plate, by unscrewing the Allen bolts using a 1/8" Allen key.
2	Once the retainer is removed the filter plate can be easily removed by tipping the cap upside down.
3	With the filter removed, a PTFE O-ring is revealed. This should be inspected for damage and cleaned together with the filter.



EV series cap with filter plate installed



Step 1a - Unscrew filter retaining plate



Step 1b - Remove filter retaining plate



Step 2 - Remove filter plate



Step 3 - Check PTFE O-ring



Ensure the filter plate is thoroughly cleaned between runs to ensure it does not become blocked. We recommend cleaning in an ultrasonic bath with an appropriate solvent.

6.3. Servicing the Seals - EVK1L

A common feature of all the Core Separations vessels is the presence of a “weep hole”. This hole helps determine the condition of the energised sprung seal. If gas is leaking from this hole, then the seal is damaged/worn and needs replacing. On the EVK vessels this hole is located in the main body.

Unlike the other vessels the EVK vessels have the seals located on a seal retaining plate. To access this plate the head needs to be fully disassembled (See Assembly). Before this is attempted, ensure the vessel is fully de-pressurised before removing any of the pipework.

1	Using the lid bars provided, unscrew the vessel cap by turning counterclockwise on vessel. <i>Note - There are four holes in the side of the outer cap to help unscrew the vessel.</i>
2	Once the lid is removed, the head can be dismantled by removing the 4 Allen bolts in the centre of the head using an 3/16" Allen key.
3	Once the bolts have been removed the head can be dismantled into 4 parts, a brass cap, brass ring, seal retaining plate and inner cap.
4	Once the head is fully dismantled the seal can be removed from the seal retaining plate. When replacing the seal ensure the spring faces the lip of the seal plate.



Step 1 - EVK series vessel - Unscrew cap counterclockwise



Step 2a - Remove Allen bolts



Step 2b - Remove inner cap



Step 3 - Dismantle head to reveal seal plate



Step 4 - Remove seal from plate



Take care not to damage the pistons when removing the heads.
Do not scratch seal seat, this will cause seals to leak prematurely

6.4. Servicing the Seals - EVB Baskets

Baskets are used to make charging and discharging vessels with various materials easier. When using an EVB series basket during an extraction, care needs to be taken to ensure the seals on the basket remain intact and undamaged. The operation to remove and replace the seals is described below:

1	On the EVB series baskets, the upper and lower portion of the basket contains two O-rings.
2	The O-rings can be removed using an O-ring pick or a stanley knife. The O-ring can be pierced and removed
3	To replace the O-rings ensure the recess is clean and free from dirt. Insert the replacements and using a flat surface ensure they are perfectly flat and press the O-ring into place.



EVB series basket



Step 2a - Pierce basket O-rings with a stanley knife or O-ring pick



Step 2 - Remove O-ring



Step 3 - Press O-ring into position on a flat surface

6.5. Servicing the Seals - EVB-Tech Baskets

Core Separations offer two types of basket, an EVB basket as described above and an EVB-Tech basket. The main differences with the Tech basket, is the use of an energised lip seal for better sealing and a double ended closure. The basket can accommodate a seal at either end, but only 1 seal should be installed at a time.

1	To replace the seal, first unscrew the lid counterclockwise.
2	Remove the lid to reveal the energised seal
3	Pull the seal towards you to remove.
4	Ensure the recess is clean and free from debris before adding a new seal. If the seal is added to the top of the basket, ensure the spring faces towards the basket body. If the seal is added to the base, ensure the spring faces away from the body.



Do NOT install two seals on this basket as this will create a pressure differential between the basket and the vessel. This could cause damage to the basket.



Step 1 - Unscrew head



Step 2 - Remove lid



Step 3 - Remove seal



Step 4 - Replace seal and lid



The basket accommodates seals on both ends of the basket. Ensure only one seal is installed during use to allow equalisation of pressure on the outside of the basket.

07

• Spare Parts

EV5-50

Part Number	Description	Quantity
Contact Core Separations for details		

EV100

Part Number	Description	Quantity
S175VID	Seal, 1.75" VID	2
FT100-5U	Frit Assy, 5um	2
FS100	Frit Retainer, 1.75 VID x 0.075 wide	2

EV500 - 1L

Part Number	Description	Quantity
S300VID	Seal, 3.00" VID CS vessel GFP 500mL-1L	2
OT1L500MLFR	O-ring, Teflon 1L/500mL Cap Assy	2
FT225-5U-Assy	Frit Assy, 2.25 x 0.076" 5 micron	2
FS300	Frit Retainer, 3 VID x 0.075 wide	2

EV3L - 10L

Part Number	Description	Quantity
S4375VID	SEAL, CS VESSEL GFP - 5L	2
OT5LCA	O-ring, Teflon 5L Cap Assy	2
FT325-5U-Assy	Frit Assy, 3.25" 5 micron	2
FR-425VID	Frit Retainer, 4.25 VID	2

EVK1L

Part Number	Description	Quantity
S4375VID	Seal, CS Vessel GFP 4.375" ID	2

EVB

Part Number	Description	Quantity
OT1L500MLBA	O-ring, PTFE 1 Liter/500 mL basket	2
FT2709-40U	Frit, 40um	1
FT2709-5U	Frit, 5um	1

EVB-Tech (EVKB)

Part Number	Description	Quantity
S375ID	Basket Seal – Seal, 3.75" ID x 4.25" OD, 1L Basket 1100 Bar	1
FT300-02U	Porous frit disc -- Frit, 3.00" dia x 0.078" x 0.2 micron	2
FS300	Perforated disc frit support – Frit support, 3.00" dia x 0.075 wide	4
BS1000	Bottom Seal, 1L Basket, 1100 bar - PTFE	1

08. Schedule

The vessels efficiency can be safeguarded by following the preventive maintenance schedule below:

Control	Daily	Weekly	Monthly	6 Monthly	Year
Energised seals (Replaced)					X

The maximum number of cycles for each vessel before we recommend re-assessment and re-qualification is calculated using ANSYS FEA analysis, based on operating the vessel at maximum pressure and temperature.

It is the users responsibility to maintain a log of the vessels use, in-order to determine when it should be returned for re-qualificaion.

Part Number	Number of Cycles	Number of Years
EV500 / EV500SP	59,618	20
EV1L / EV1LSP	40,494	20
EV5L	7,658	20
EVK1L	23,726	20



09 • Troubleshooting

Problem	Cause	Solution
Leaking from, the Weep hole in the body	Worn Piston Seals	Replace seals

Problem	Cause	Solution
The vessel does not build pressure	The vessel is not connected to the CO ₂ supply.	Check if there is CO ₂ in the cylinder and at pressures between 50 and 55 bar.
	Leaking from the seal	Check the weep hole on the vessel body. If leaking, replace seal
	Valves closed - if used	Open position of inlet vlaves.
	Rupture disk activated	Check rupture disk and replace if nessecary.

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 Core Separations