Complete S5

Assembly and operating instructions

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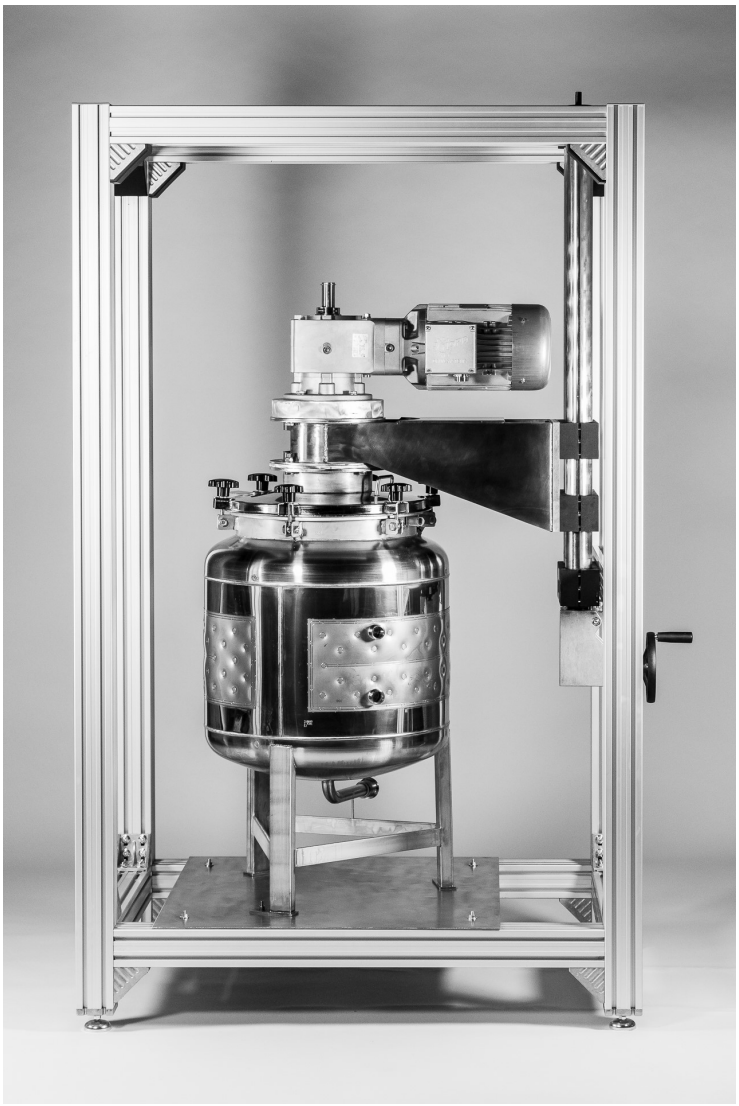
Product designation

Complete S5

Motor serial number:



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1 Definitions

System – The assembly of products delivered by SpinChem AB.
Customer – The company or organization to which the system is delivered
Operator(s) – The person(s) operating the system
Standard operating procedure (SOP) – Step-by-step instructions for routine operations

2 Limitations

The system is not delivered in a finished state, meaning that the customer is responsible for the assembly and integration of necessary safety measures to comply with health and safety guidelines. Certain components may be individually CE-marked or otherwise certified, but any such markings are not to be interpreted as covering the system.

3 General description and intended application

The intended use of the system is research and development of chemical processes. It consists of a rotating bed reactor, loaded with a solid phase consisting of individual particles of minimum individual particle size 100 µm, installed in a stainless-steel vessel. The vessel is filled with a liquid compatible with the materials of construction of the system.

4 General specifications and dimensions

An overview of the system is shown in Figure 1. The essential specifications of the system are given in Table 1. Operation of the system should always conform to the specified conditions.

Figure 1: Overview of the system.

Table 1: Specifications and operating parameters per module of the system

Shipping dimensions	**1200 x 800 x 1180 mm**
Service footprint	1200 x 800 x 2200 mm
Service weight (approximate)	400 kg
Maximum liquid volume (approximate)	120 L
Nominal RBR volume (solids)	5 L
Rotating bed reactor model	RBR S5
Maximum speed	339 rpm
Ambient temperature range	5-40°C
Jacket temperature range	0°C – 50°C
Process pressure range	Atmospheric only
Glass joint sizes in lid	1x B14, 2x B19, 2x B29
Jacket adapters	G1"
Motor power	2.2 kW
Motor voltage	400VAC 50Hz
M.O.C. – Vessel	Stainless steel 1.4404 / 1.4301
M.O.C. – RBR (incl. shaft)	Stainless steel 316L
M.O.C. – Bearing housing O-ring	NBR
M.O.C. - Lid gasket	EPDM
M.O.C. – Shaft radial seal	NBR
M.O.C. – Frame	Aluminium / Stainless steel

5 Assembly and installation

The following steps should be taken when assembling the system for the first time, or any time when it has been disassembled in part or entirely.

5.1 Preparing the system for assembly

1. Prepare space on an even and level surface, where you can conveniently access all sides of the system. 4x4 meters recommended.
2. Disassemble the packaging such that you have an overview of all the components.

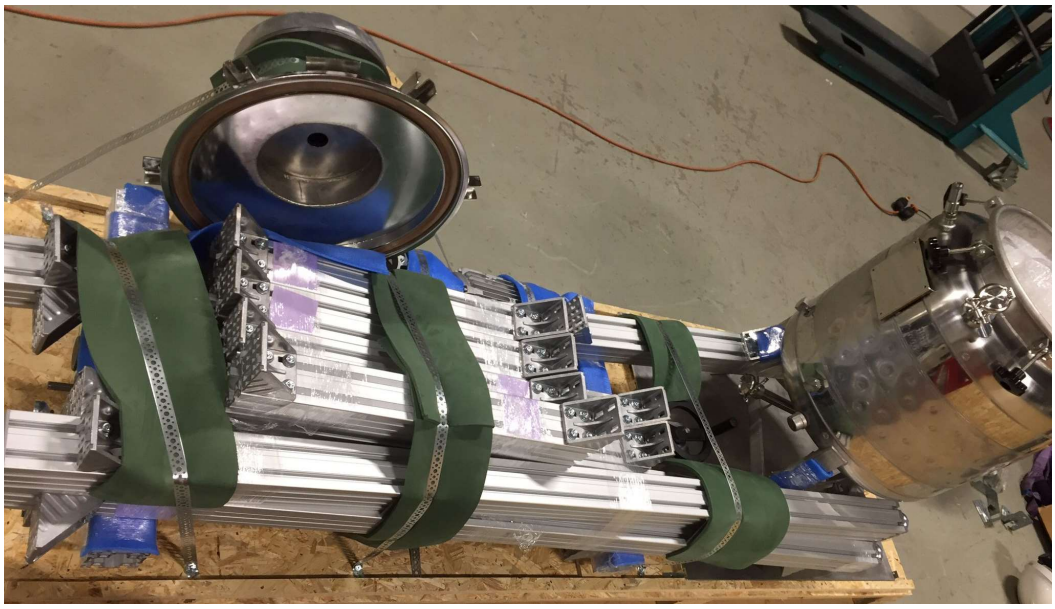


Figure 2: Contents of shipment

5.2 Assembling the frame of profiles

All but three of the aluminium profiles are numbered, and the two without numbers can be separated by their length. Two of them are equal length and go on the upper longside of the frame, while the third is the shortest and goes on the upper shortside of the frame. Assemble the profiles in order:

- 3 connected to 6
- 4 connected to 6
- Unnumbered short connected to 3 & 4
- Unnumbered long connected to 3
- 7(a) connected to 3
- 1 connected to 7(a) and unnumbered long
- Unnumbered long connected to 4
- 7(b) connected to 4
- 2 connected to 7(b) and unnumbered long
- (3x) 8 connected to 7(a) and 7(b). **See approximate locations in** Figure 6**.**
- 5 connected to 1 and 2

Install gusset covers over all visible gussets and slide the plastic profile covers in their tracks as needed to prevent the ingression of dirt.

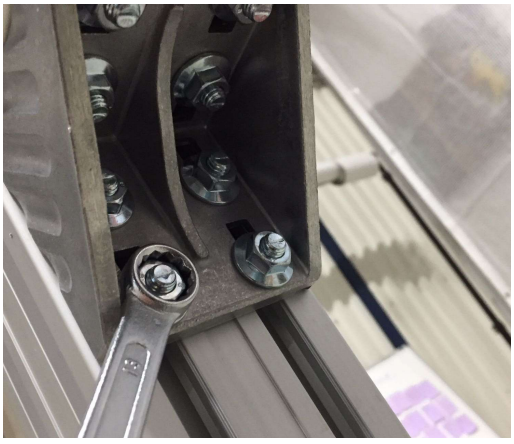


Figure 5: Fastening of gussets to profiles.

Figure 4: Gusset covers

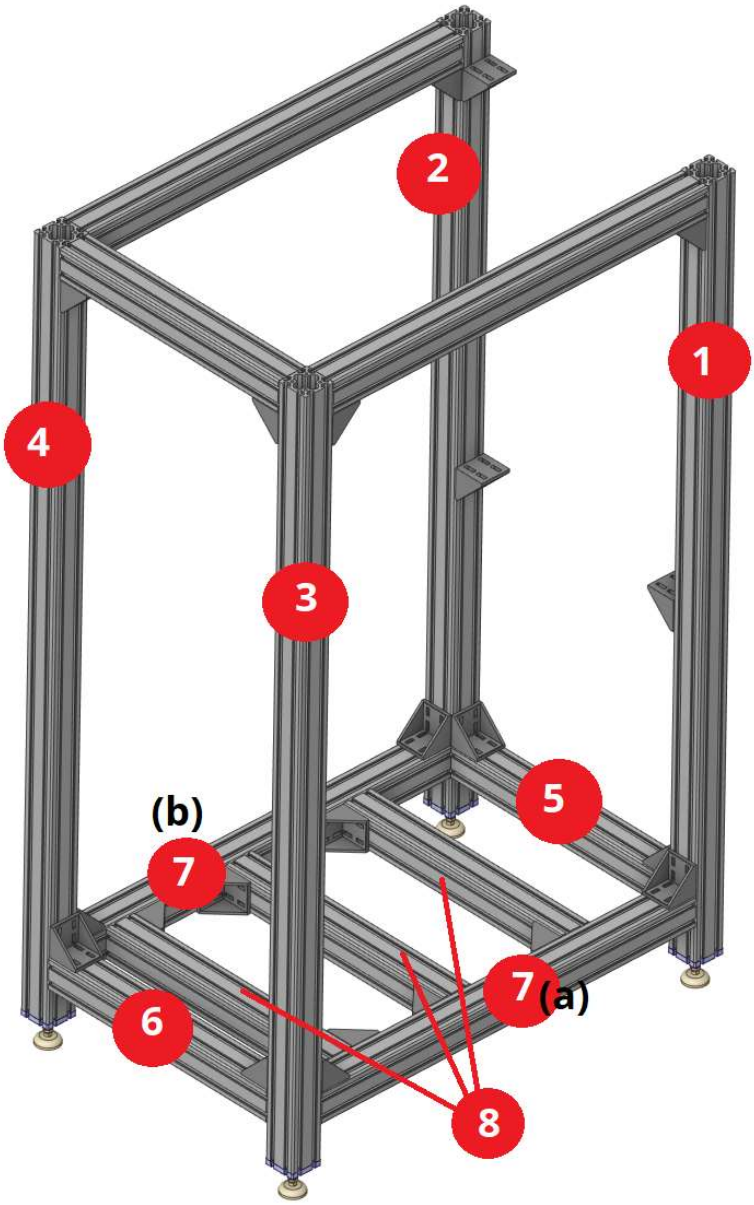


Figure 3: Numbering of the profiles.

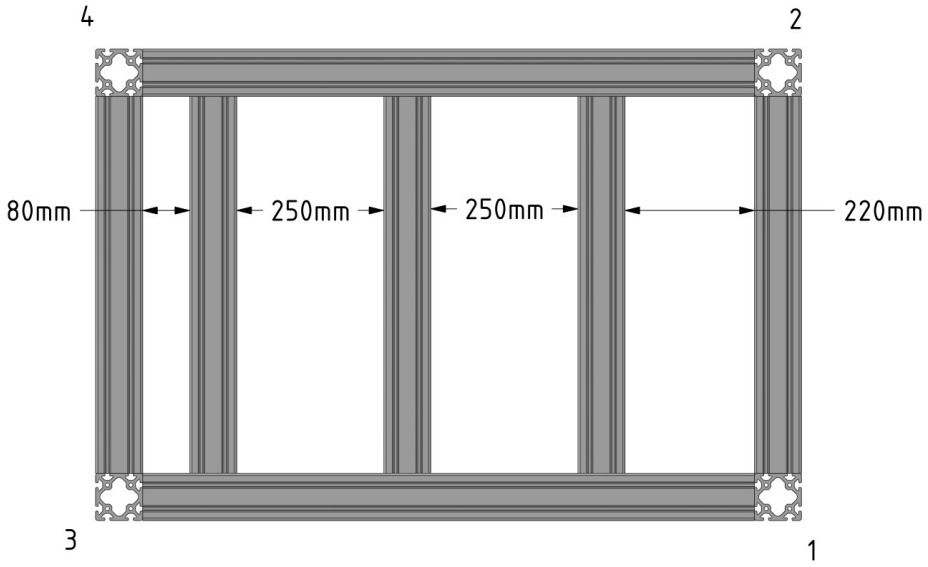


Figure 6: Locations of profiles on the frame floor.

5.3 Installing the lift

The lift comes attached to two profiles. The profiles go on top of the gussets (angle brackets) installed on the profiles 1 and 2. The handle should be pointing out from the system. *It may be necessary to temporarily separate profiles 1 and 2 by manual force to get the upper profile in place. Install all (16x) screws on the gussets.*

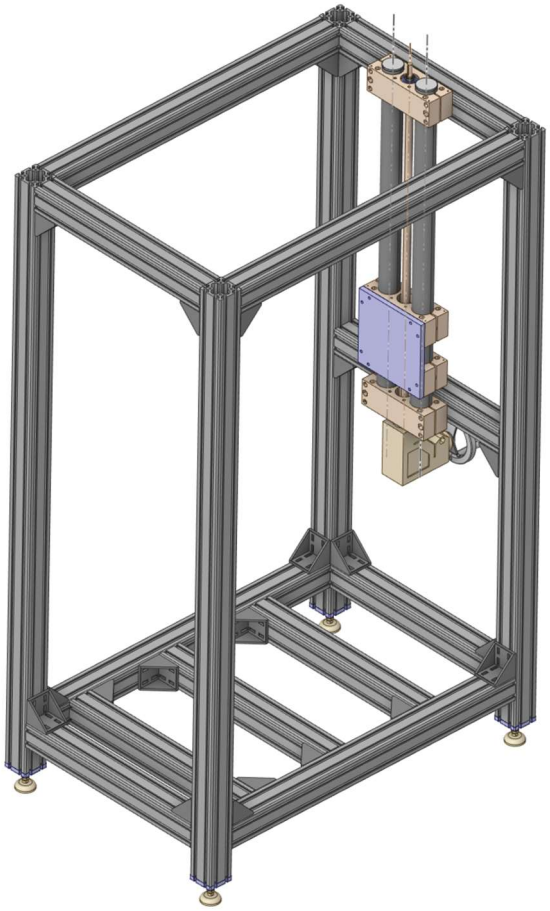


Figure 7: The lift installed in the profiles.

5.4 Installing the motor mount

There are 4x bolts that attach the motor mount to the lift. One or more persons holds the motor mount in place while another person screws in the bolts.

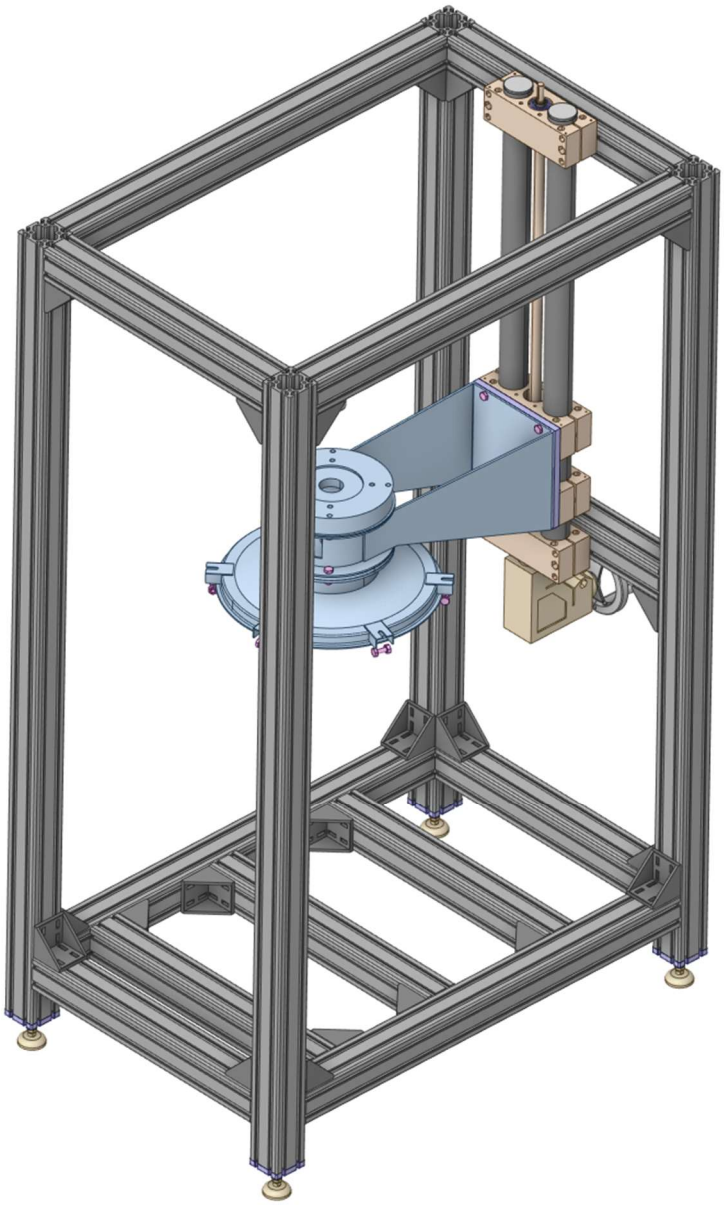


Figure 8: The motor mount installed on the lift.

5.5 Installing the floor and vessel

The vessel and floor can be lifted in place as a unit. Raise the lift to give room for installing the vessel.

Take care that **the jacket connections are oriented as in** Figure 1**.** You may need to move the outermost of the three profiles (#8) under the floor to properly align the vessel with the lid.

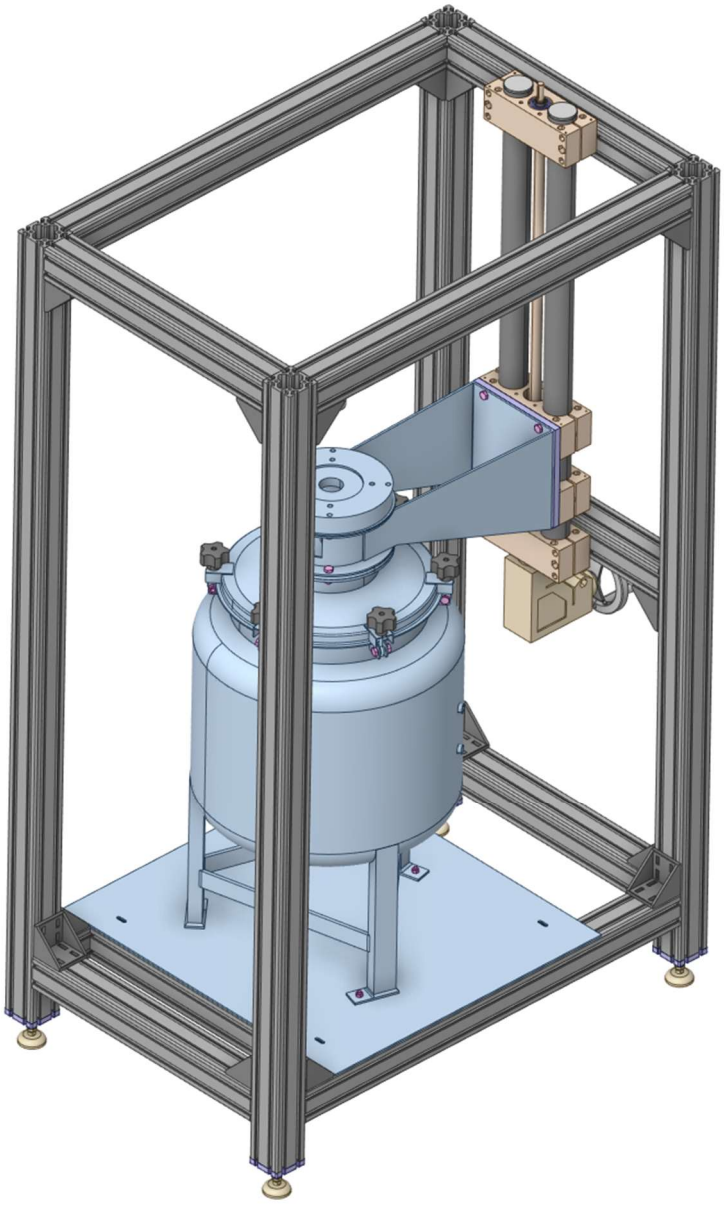


Figure 9: The vessel and floor installed under the motor mount.

5.6 Installing the motor

The motor weighs approximately 40 kg and is best installed using lifting equipment and slings. Position the gearbox over the motor mount, orienting the electric motor towards the lift. Attach the four bolts.

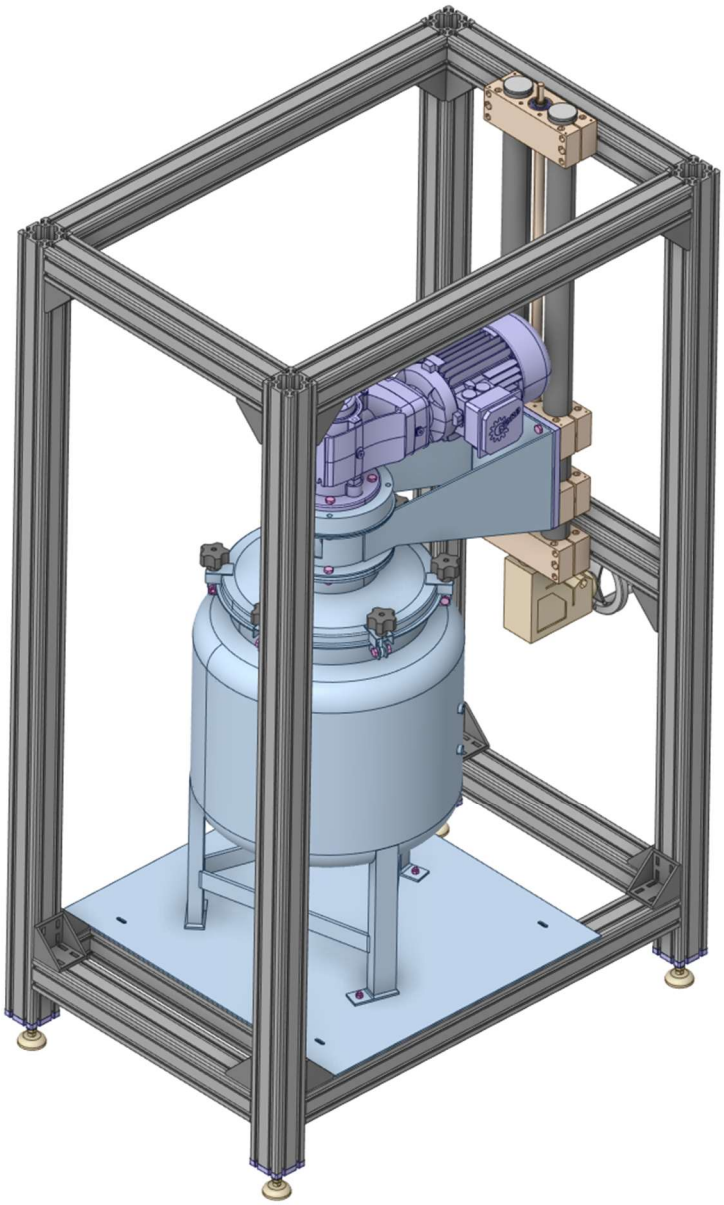


Figure 10: The motor mounted on the system.

5.7 Installing the RBR shaft

Tighten the shaft collar for the desired RBR height using the Allen keys (size 5). Place the shaft key in one of the sockets. Default is the 2nd from the top of the shaft. When using the RBR S5, **the shaft key should not be installed in the top socket**.

The shaft should be installed top-down, i.e., with the bottom of the shaft going into the gearbox of the motor from the top. If the shaft catches onto the bearing, try to realign the motor with the motor mount.

Lubricate the shaft using the supplied O-ring/seal grease before installation through the shaft seal below the bearing.

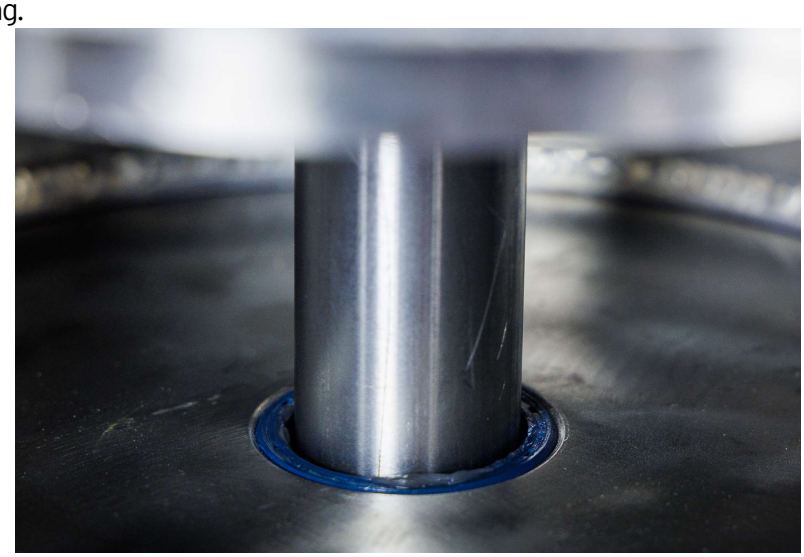


Figure 11: Close-up of the shaft seal through the inspection window. Grease should be applied to the shaft before it passes through the seal.

Tighten down the bearing on the shaft by the two Allen screws (size 3).

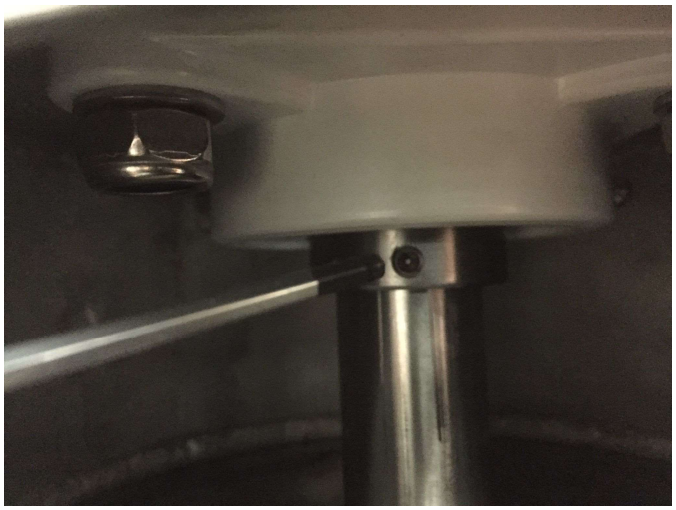


Figure 12: Close-up of the bearing through the inspection window. There are two Allen head (size 3) screws that fixate the shaft in the bearing.

6 Operating instructions

6.1 Opening the system for installation/removal of RBR

1. Ensure that the system is in a safe state. Engage any measures to temporarily set the system in a confirmed safe state (e.g., safety breakers, mechanical guards, etc.).
2. Loosen the six thumb screws.

Figure 13: Operation of the thumb screws on the vessel.

3. Turn the handle on the lift counterclockwise to raise the lid.

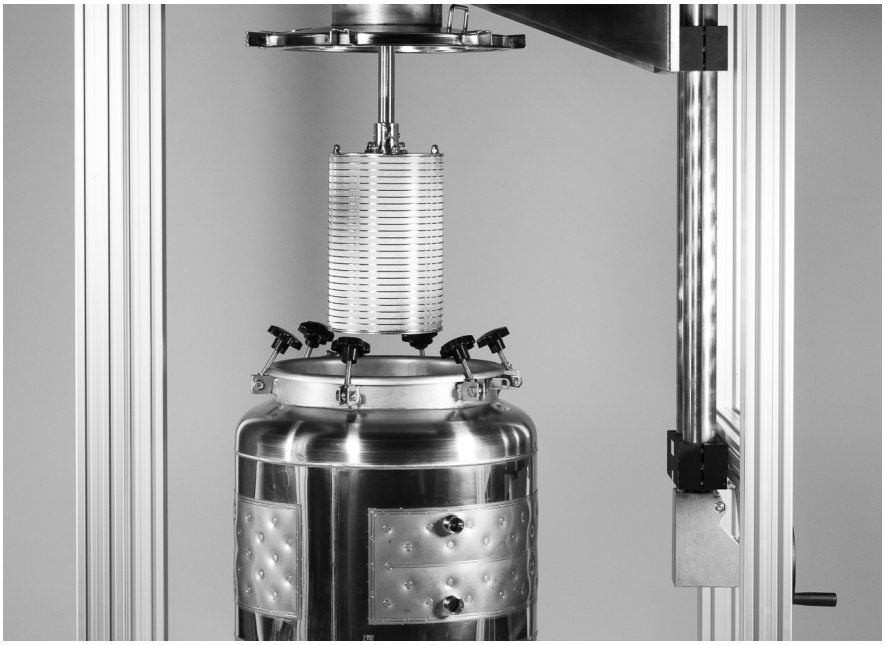


Figure 14: The lid in its raised state.

6.2 Installing the RBR S5

1. Assemble the RBR S5 in accordance with the separate assembly instructions in 10 Appendix A - Assembly instructions for RBR.

2. Open the system as per 6.1.
   ! For added security place a robust piece of material, e.g., the supplied stainless-steel grid, or a plastic or wooden sheet, on top of the vessel to protect against dropping the RBR S5 into the vessel.

3. Place the RBR S5 on the shaft and insert the clevis pin through the shaft coupling.
   ! If the clevis pin cannot be pushed through the shaft and coupling, rotate the shaft **or** the RBR 180° and try again.
4. Insert the cotter pin in the small hole through the clevis pin.
5. Tighten the grub screw that is parallel with the clevis pin.
   ! The two grub screws that are perpendicular to the clevis pin should not be used with the clevis pin installed.
6. Try one full rotation of the RBR by hand and confirm that no part of the RBR is interfering with the baffle or any other objects in the vessel (e.g., probes).

6.3 Closing the system

7. Turn the handle on the lift clockwise to lower the lid until it contacts the vessel.
   ! Do not over-compress the system by lowering the lid too far.
8. Lock the six thumb screws.
9. Ensure that the system is in operational state: the vessel is closed, the thumb screws are tightened, and there are no loose items at risk of getting caught on the rotating shaft.

The system is now ready for use.

7 Transport

When assembled, the system can be moved very carefully using a fully functional forklift or pallet jack, while taking care not to tip the system over.

! Move the system with great care not to tip it or collide with any objects.

Once the system has been moved to the new location, adjust the levelling feet to ensure that the system is fully stable.

8 Risks, warnings, and requirements

These requirements are a minimum and by no means an exhaustive list of safety measures that need to be implemented for safe installation and operation of the system. It is the obligation of the manufacturer of the complete machinery to conform to the relevant directives and regulations and implement all additional safety measures required.

8.1 Limits of operation

- ! The system must not be operated with an empty (unloaded) RBR since this puts larger stress on the system than it is designed for.
- ! The permitted operating conditions of the system (see Table 1) must be respected.
- ! Operation of the system must not create excessive vibration or significant movement in the system. If such behaviour is observed, confirm that all fittings on the RBR are fastened and functional. Attempt to correct any imbalances of solid phase loaded in the RBR. If the issue persists, contact SpinChem.

8.2 Residual risks

- ! The system must be levelled before started the first time. Intermittently check that the system remains level to avoid damage to equipment or operators.
- ! The rotating drive shaft presents a residual hazard where items such as hair or clothing risk getting caught during operation.
- ! All parts of the system must be properly connected to electrical ground. Ensure that electrical connections are properly installed by a qualified person.
- ! An emergency stop must be installed according to regulations and best practices.
- ! A safety breaker for safe servicing must be installed according to regulations and best practices.

8.3 Foreseeable misuse

- ! Do not operate the system with the lid unlocked or open.
- ! Do not retrofit the system with another motor, vessel, or stirrer element.
- ! Do not use the system with an empty RBR.
- ! Do not use system with an uneven load of material in the RBR.
- ! Do not operate the system in an unbalanced or unlevelled position.
- ! Do not operate the system with any loose objects outside of the RBR. Ensure that any mesh bags are completely contained by the RBR.
- ! Do not operate the system without confirming that all fasteners (nuts and pins) on the RBR are securely tightened.

9 Service instructions

9.1 Standard Operating Procedure for maintenance

The following is a suggested Standard operating procedure (SOP) for maintenance inside the vessel or on the rotating bed reactor (e.g., solid-phase replacement). It is the obligation of the customer to consider all hazards and safety risks in accordance with applicable regulations and occupational safety requirements.

1. Stop the motor if it is running.
2. Drain the vessel.
3. Start the motor and allow any liquid to be spun out of the RBR.
4. Stop the motor.

5. **Engage any measures to temporarily set the system in a confirmed safe state (e.g. using safety breaker(s), mechanical guards, etc.).**
6. Loosen the six thumb screws on the reactor vessel.
7. Turn the handle on the lift counterclockwise to raise the lid.
8. Perform maintenance task, e.g.:
   a) Detachment of the RBR for replacement of solid-phase.
   b) Replacement of solid phase with the RBR still attached to the shaft.
   c) Washing the vessel.
9. Turn the handle on the lift clockwise to lower the lid until the vessel contacts the lid.
   ! Do not over-compress the system by lifting the vessel too far.
10. Lock the six thumb screws.
11. Ensure that the system is in an operational state: the vessel is closed, the thumb screws are tightened, and there are no loose items at risk of getting caught on the rotating shaft.
12. Disengage any measures to temporarily set the system in a confirmed safe state (e.g., using safety breaker(s), mechanical guards, etc.).
13. The system is ready for use and the motor can be started again.

9.2 Rotating bed reactor service

Common operations are described in Appendix A - Assembly instructions for RBR. For other operations refer to the contents on https://www.spinchem.com/support/ and contact SpinChem with any doubts or questions.

9.3 Bearing service

Refer to the manufacturer's instructions in 11 Appendix B - Bearing service.

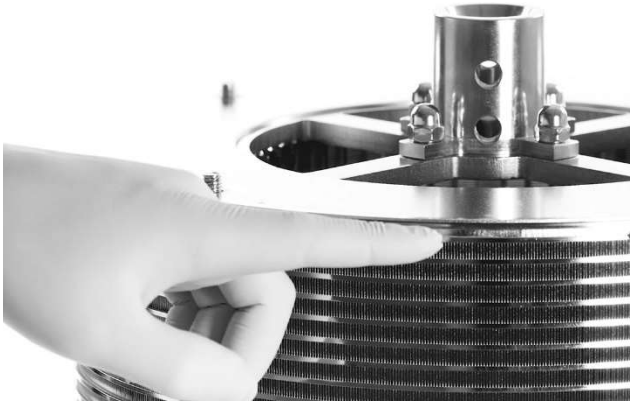
9.4 Frequency inverter service and operation

Refer to the provided manual *Delta Standard Compact Drive MS300 Series User Manual*.

10 Appendix A - Assembly instructions for RBR

Loading the RBR S5

1. Rest the RBR S5 on a solid surface
2. Release the four nuts on the lid of the RBR S5 using a size 13 wrench
3. Pry the lid open with your hands or a plastic tool
4. Remove the lid
5. Fill the RBR with:
    a. free solid phase directly from a container, bag, etc. or
    b. bags (sold separately by SpinChem AB), packed with solid phase.
6. Align the lid with the threaded rods on the RBR S5
7. Firmly press down on the lid, ensuring that it seals against the outer and inner filter cylinders.



8. Fasten the four nuts on the lid of the RBR S5

Disassembly for cleaning

1. Rest the RBR S5 on a solid surface
2. Release the four nuts on the lid of the RBR S5 using a size 13 wrench
3. Pry the lid open with your hands or a plastic tool
4. Remove the lid
5. Grip the outer filter cylinder with your fingers and press down on the inner cylinder with your thumbs.

6. Cleaning of the filter cylinders is most efficiently done using pressurized air, water or solvent jets or with a plastic bristled brush.

11 Appendix B - Bearing service

The bearing can be filled with more grease through the grease nipple on the side of the bearing housing, using a grease gun. Avoid overfilling the bearing. Turn the bearing and feel/listen for the improvement while you refill.

The new grease should be chemically compatible with the current grease. Here are the details of the grease:

- Aluminium complex
- NSF grade H1 (food grade)
- Viscosity class NLGI 2