



**Bulk Solids Handling Equipment**

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# **INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS FAST CLEAN ROTARY VALVES**

(Fitted with replaceable blades)

Rota Val Ltd Fast Clean Rotary Valves are designed to control flow in dry solid metering and pneumatic conveying systems operating under negative or positive pressure differentials. Close manufacturing tolerances and wide range of interchangeable components and design features allow each valve to be supplied to match a particular application; valves should not be used for any other duty **WITHOUT CONSULTING OUR TECHNICAL SALES DEPARTMENT.**

**IMPORTANT: ALWAYS QUOTE VALVE SERIAL No. IF FURTHER INFORMATION OR SPARE PARTS ARE REQUIRED.**

## **HEALTH AND SAFETY**

The valve contains moving parts that can be injurious; it is the responsibility of the system installer / user to ensure the safe installation and operation of the valve. In particular it must be adequately protected and guarded, in compliance with local health and safety regulations. The motor must be isolated before any cleaning, maintenance or adjustment is carried out; do not operate the valve under power with the drive guard, or any other part of the valve, removed. Only competent persons must be used to maintain the valve.

**IT IS THE RESPONSIBILITY OF THE PURCHASER / USER OF THIS EQUIPMENT TO ENSURE THAT THESE HEALTH AND SAFETY INSTRUCTIONS ARE PASSED ON TO THOSE PERSONS LIKELY TO BE AT RISK.**

## **RESIDUAL HAZARDS**

- 1.1 The valve is intended for installation in fully enclosed pipework, when installed the pipework will prevent access to the moving parts. The valve must not be used if either connection remains open.
- 1.2 Care must always be exercised when removing and installing the rotor. Beware of trap points and sharp edges paying particular attention to the vane edges, the end cover/body interface and the interconnection of the rotor shaft in the drive hub and tail piece.
- 1.3 Deterioration of the gland seals can lead to leakage along the shaft and there will be some product retention in the housing when the valve is opened for cleaning or maintenance. Proper provision for dealing with any potential leakage of the conveyed material must be made.
- 1.4 The valve is fitted with hexagonal headed dome nuts to prevent direct access to the valve internals. If the valve is intended to be frequently cleaned a safety switch may be necessary (connected to the motor control circuit) to prevent unauthorised access.
- 1.5 The product may be an explosible dust - Precautions must be taken to ensure the risk of explosion is eliminated prior to the cleaning or maintenance period and that the valve is correctly reassembled so that it will successfully contain any explosion which may occur.
- 1.6 There may be a head of material above the valve which must be removed or isolated before opening the valve.

## **NOISE**

The noise generated by the valve is insignificant compared to the motor and gearbox under normal conditions. Any significant noise generation, is an indication of product build up, trapped particles or mechanical failure and as such can be addressed (see operation and commissioning)

## **HANDLING**

The valve should remain in its packaging until ready for assembly into the system and, as such, it may be moved using equipment fit for the purpose such as pallet trucks or fork lift trucks. Refer to Fig 1 for weight details.

Prior to installation remove all packaging. The valve may be lifted by attaching eye bolts, slings or forks under or around the top flange or slings through the bearing housings (avoiding contact with the rotor shaft). Do not lift using gearbox, motor or by any guard.

Typical weights are shown below (some variation can be expected due to the options available for rotors and GMU's);

| <b>VALVE SIZE</b> | <b>WEIGHTS (kg)</b>   |              |
|-------------------|-----------------------|--------------|
|                   | <b>COMPLETE VALVE</b> | <b>ROTOR</b> |
| FC 125            | 100                   | 8            |
| FC 150            | 160                   | 13           |
| FC 200            | 270                   | 23           |
| FC 250            | 300                   | 30           |
| FC 300            | 400                   | 50           |

## **INSTALLATION**

- 2.1 Check the valve externally for damage and internally for foreign objects. Install the valve using compressible gaskets on both flanges; the valve body must not be stressed or used to support ancillary equipment. Valves must be installed the correct way up, i.e., with the slide rails horizontal and below the valve centre line. Air purge shaft seals (if fitted) must be connected to a regulated clean dry air supply at a pressure 0.33 bar (5 p.s.i.) above the maximum static pressure in the valve.
- 2.2 The motor must be connected to a suitable electrical supply in accordance with the manufacturer's nameplate / operation and maintenance instructions. Check that the Geared Motor Unit is filled with lubricant, in accordance with the manufacturer's instructions. Top up or fill as necessary. Check that the valve rotates in the correct direction. Check the arrow on the drive guard. The valve is now correctly installed and ready to operate.
- 2.3 Connect the extractor screw sensor to the motor control relay circuit. It should ensure the motor supply is isolated if the extractor screw is not in position, switch details are provided with this manual.

## **OPERATION AND COMMISSIONING**

- 3.1 The speed has been set at our factory for the duty and throughput required: some small variation in speed may be necessary and this can be accomplished by changing the sprocket ratio, refer to dismantling instructions.
- 3.2 The valve performance is related to that of the system and any major departure from the specified throughput will require investigation.
- 3.3 Failure of the valve to maintain its performance may indicate excessive wear and the valve clearances should be checked.

## **MAINTENANCE**

- 4.1 Rota Val Ltd Fast Clean Rotary Valves are designed to require minimum maintenance: however, regular attention in accordance with the following instruction will prolong valve life.
- 4.2 **BEARINGS**  
Standard bearings are greased packed and sealed for life, no maintenance being necessary. Bearing should be checked for wear and damage every 3 months or 2,500 hours and replaced if necessary. Replace every 12 months or 10,000 hours (See DISMANTLING and REASSEMBLY).  
High and low temperature bearings consist solely of a small bush these must be checked for wear and excessive rotor end float every 3 months or 2,500 hours and replaced if necessary. Replace every 12 months or 10,000 hours. (See DISMANTLING and REASSEMBLY).
- 4.3 **SHAFT SEALS**  
The seals fitted are not adjustable and leakage can only be cured by replacement.
- 4.4 **AIR PURGE**  
Ensure that the air passages to the lantern ring do not become blocked.
- 4.5 **CHAIN DRIVE**

Chain tension should be checked and adjusted at monthly intervals. The drive guard cover will have to be removed.

**WARNING; ISOLATE MOTOR BEFORE REMOVING GUARD.**

Adjustment is by nuts and studs under the G.M.U. The tension is correct when total up and down movement is equal to the pitch.

NOTE: The distance between the motor mounting plate and gearbox feet should be equal on all four studs. Lubricate with a suitable chain grease.

4.6 GEARED MOTOR UNITS

Geared units are proprietary and are to be maintained in accordance with the manufacturer's instructions, provided with this manual.

## **REFURBISHING**

- 5.1 Wear and tear within the Rotary Valve is always uneven, usually affecting all internal components. Some improvement of performance may be achieved by replacing the most worn component(s), the improvement in most cases will be marginal and temporary.

## **CLEANING**

Item numbers listed below (e.g.; rotor (4) ) refer to figure 1.

6.0 EXTRACTING THE ROTOR

**CAUTION; rotors fitted with replaceable blades must be handled with care in order to avoid inadvertent blade movement.**

If blades are removed during the cleaning process, then the complete valve assembly will have to be removed from the installation; it is necessary to gain access to the valve inlet throat to reset the blade radial and end clearances. Refer to section 7.

- 6.1 Ensure the feed into the Rotary Valve is clear of product and isolate motor.

**WARNING; ENSURE MOTOR POWER IS OFF BEFORE PROCEEDING FURTHER**

Remove the plug (36) from the non drive end bearing cover (9).

Remove rotor extractor tool (20) from its position in non drive-end end-cover (3) and screw it to the rotor (4) through the bearing cover (9), lifting the extractor retainer (11) until the extractor tool is fully home. Nip up hand tight using the tommy bar (23) provided.

**CAUTION; do not use any other form of tool which may overtighten the extractor tool.**

- 6.2 Remove the end cover fixings (21).

- 6.3 Pull out the rotor (4) and end cover (3) as an assembly along the slide rails (28) using the nearest cross member on the end cover support (18) as a handle.

**CAUTION; do not pull on the bearing housing or other part of the end cover as this may cause contact between rotor and bore. Beware of sliding parts and trap points; keep hands and fingers clear.**

- 6.4 The rotor may be cleaned at this stage.

**CAUTION; if cleaning the rotor while it is still attached to the end cover do not turn it independently of the extractor (20); ensure both turn simultaneously to prevent over tightening or loosening of the tool.**

**WARNING; DO NOT WORK ON THE ROTOR WITHOUT THE EXTRACTOR TOOL FITTED.**

6.5 The rotor may be cleaned away from the valve; fit the support tray (24) below the rotor (the rotor may need to be rotated slightly to allow the tray to fit). Turn the extractor tool anti-clockwise to push the rotor free of the tail piece (6) and rest on the support tray  
The rotor may now be lifted clear.

6.6 Leave the extractor tool in the bearing housing.

**CAUTION; do not replace the extractor tool in position on the body.**

6.7 Remove the rotor blades (22) only as necessary to facilitate cleaning. Note: access to the valve inlet throat is necessary for refitting.

## 7.0 REPLACING ROTOR

Points marked \* need only be followed if the blades have been removed.

7.1\* Access to the valve inlet throat must be made available in order to finally set the blade clearances. If access cannot be achieved with the valve in-situ, then the complete unit must be removed from the installation.

7.2\* Remove drive guard and disconnect chain. Reassemble all blades (22) loosely on the rotor (4) before proceeding further.

7.3 Push end cover (3) against end stop (19), rest the rotor assembly on the support tray and push rotor (4) and the support tray (24) until the rotor is nearly touching the end cover.

7.4 Align rotor journal (it may need to be lifted slightly to line up with the gland hole) and push home.

7.5 Tighten extractor tool (20) until rotor is fully home.

7.6 Turn rotor and tool simultaneously to free support tray.

7.7 Remove support tray.

7.8\* Adjust each blade (22) in turn to ensure that the blade end touches the inside face of the end cover. The blades should be pushed downwards towards the shaft centre line and held in place by nipping up the blade fixing screws (37).

7.9 Line engagement tongue (on drive end of rotor) with drive hub (5) by turning rotor and extractor tool simultaneously.

**CAUTION; do not force rotor home if it is out of position**

7.10 Push rotor assembly fully home.

**WARNING; Beware of sliding parts and trap points; keep hands and fingers clear.**

7.11 Replace end cover fixings (21).

7.12 Remove extractor tool by opening extractor retainer (11) and unscrewing.

**CAUTION; do not unscrew extractor tool while extractor retainer is closed.**

- 7.13 Replace the extractor tool in its position on the end cover.
- 7.14 Replace the plug (36) in the bearing cover (9).
- 7.15\* Loosen the blade fixing screws (37) on one blade (22) only. Using feeler gauges, centralise the blade horizontally to give equal end clearances, leaving the feeler gauges in position. Pull the blade (22) upwards to contact the body bore and nip-up the fixing screws (37), tap the blade downwards to achieve the radial clearance stated in the technical specification sheet. Tighten all fixing screws and remove feeler gauges. Recheck clearances and check rotor rotates free through 360°. Repeat for remaining blades.
- 7.16 Connect drive chain and refit drive guard
- 7.17 The motor supply may now be re-connected.

## **INSPECTION**

- 8.1 Inspection of internal surfaces can be performed with reference to cleaning instructions, sections 6 & 7. Check all surfaces for scoring and wear, any high spots may be eased away using emery cloth, a smooth file or grind stone. Acceptance of deep score marks or excessive wear will depend on the duty requirement and the characteristics of the media handled. If in doubt consult our technical sales department. Refer to maintenance section for wear limits.
- 8.2 Check rotor shaft ends for burrs, dress away as necessary using emery cloth, smooth file or grind stone. Check seal journal for wear, any excessive wear in this area will require replacement of rotor or alternatively the area may be built up using a recognised cold reclaim technique and reground.
- 8.3 Inspection of internal components seals, bearings etc. may be carried out after reference to dismantling instructions, sections 9 to 12. Check journals on tail piece (6) and drive hub (5), for wear, check bearing housing for signs or damage. Check rotor extractor tool (20) for damage, refurbish or replace as necessary.
- 8.4 Replace seal rings (13), bearings roller (25) and linear (29), tab washers (27), lock nuts (26), chain sprockets as necessary.

## **DISMANTLING**

- 9.0 NON DRIVE END
- 9.1 Following cleaning instructions until the rotor (4) has been removed.
- 9.2 Replace end cover (3) and fit one end cover fixing (21).
- 9.3 Remove extractor tool(20).
- 9.4 Pull out pivot pin (15) using suitable threaded drawing tool; thread size M6x1.0 (FC125 & 150) or M8x1.25 (FC200 to 300).
- 9.5 The end cover support (18) can now be pulled clear of the end cover (3), take care to retain the spacer pieces (17) and mark them to ensure they will be re-fitted in their original positions.
- 9.6 Undo the two socket head screws in the end stop (19) - the fixing may still be fast against the rail (28) - after loosening ½ to 1 turn use a suitable drift and tap with a mallet.

- 9.7 Draw off the end stop (19).
- 9.8 Draw off the end cover support (18).
- 9.9 Loosen the rail clamp socket head screws (16) (again fixing may be fast, refer to 9.6 above) and remove each rail in turn. Note on certain sizes this hole may be obscured by the motor mounting plate - follow instructions 10.1 to 10.5 “drive end” before completing this operation.
- 10.0 DRIVE END
- 10.1 Remove the chain guard cover.
- 10.2 Remove the chain and sprockets; taper lock type sprocket may be removed by first removing the two grub screws replace one in the previously unused hole and tighten until the sprocket is loose (if the drive hub shaft turns during any of the loosening or tightening operations the chain may be laid under or over the sprockets (as applicable) to use the resistance of the geared motor unit). The taper lock bush can be eased open with a screwdriver blade and pulled free. Take care not to drop the shaft key.
- 10.3 Remove the drive guard back plate.
- 10.4 Remove the geared motor unit.
- 10.5 Remove the motor mounting plate.
- 10.6 Remove the end cover (2).
- 11.0 END COVER
- 11.1 Remove non drive end bearing cover (9).
- 11.2 If necessary the extractor retainer (11) can be removed at this stage; unscrew the socket head screws while holding the retainer stops.
- 11.3 Remove the drive end bearing retainer (10).
- 11.4 Both drive hub assembly (5) and tail piece (6), assembly may now be drawn out of the bearing housings.
- 11.5. Each assembly can be held in vice soft jaws around the flange behind the innermost bearing.
- 11.6 Release the tab from the bearing lock nut (26) and remove the nut with a suitable ‘C’ spanner, remove the tab washer (27).
- 11.7 Draw off each bearing (25) in turn, noting the spacer (7 & 8) positions.
- 11.8 Remove the seal retainer (12) from each end and remove the seal rings (13) (two per end).
- 11.9 The linear bearings (29) should only be removed if they are to be replaced.
- 12.0 ROTOR
- 12.1 Remove the rotor blades (22) as described in section 7.

## REASSEMBLY

- 13.1 Ensure all surfaces are clean and free from burrs and accidental damage prior to each step.
- 13.2 Press one seal ring (13) to the bottom of each end cover seal housing, positioned with the smallest section down. The second seal is to be mounted the opposite way around with the smallest section up towards the seal retainer (12).
- 13.3 Replace bearings (25) and spacers (7 & 8) on drive hub (5) and tail piece (6). Fit the tab washer (27) and lock nut (26); place the assembly in the relevant bearing housing. Tighten with C-spanner until the axial play is just removed from the bearing, lock the tab.  
**CAUTION Do not overtighten the lock nut.**
- 13.4 Fit the drive end bearing retainer (10).
- 13.5 Fit the non drive end bearing cover (9) (the extractor retainer plate (11) should be assembled previous to this stage).
- 13.6 Refit the drive-end cover (2).
- 13.7 Refit non drive-end end cover (3), only one or two fixings (21) need to fitted at this stage.
- 13.8 Refit the support rails (28), the three part clamp arrangement (16) should be loose and positioned so that it fits either side of the rail. The hole should be clear to accept the rail.
- 13.9 Slide on the end cover support (18).
- 13.10 Refit the end stop (19) - position the three part clamp as 13.8 above.
- 13.11 Offer the end cover support (18) to the end cover (3) with the spacers (17) held in place and align the pivot pin holes.
- 13.12 Fit pivot pins (15).
- 13.13 Reassemble all blades (22) loosely on the rotor (4).
- 13.14 Push end cover (3) against end stop (19) and push rotor (4) on the support tray (24) until it is nearly touching the end cover.
- 13.15 Align rotor journal (it may need to be lifted slightly to line up with the gland hole) and push home.
- 13.16 Tighten extractor tool (20) until rotor is fully home.
- 13.17 Turn rotor and tool simultaneously to free support tray.
- 13.18 Remove support tray (24). Adjust each blade in turn to ensure that the blade end touches the inside face of the end cover. The blades should be pushed downwards towards the shaft centre line and held in place by nipping up the blade fixing screws.
- 13.19 Offer rotor (4) up to bore and check the leading edge will clear the bore.
- 13.20 Line engagement tongue (on drive end of rotor) with drive hub (5) by turning rotor and extractor tool simultaneously.

**CAUTION; do not force rotor home if it is out of position**

- 13.21 Push rotor assembly fully home; adjust the end cover adjustment screws as necessary, there is no need to complete the adjustment at this stage.  
**WARNING; BEWARE OF SLIDING PARTS AND TRAP POINTS; KEEP HANDS AND FINGERS CLEAR.**
- 13.22 Replace end cover fixings (21) and loosen off the end cover adjustment screws.
- 13.23 Remove extractor tool by opening extractor retainer (11) and unscrewing.  
**CAUTION; do not unscrew extractor tool while extractor retainer is closed.**
- 13.24 Loosen the blade fixing screws (37) on one blade (22) only. Using feeler gauges, centralise the blade horizontally to give equal end clearances, leaving the feeler gauges in position. Pull the blade (22) upwards to contact the body bore and nip-up the fixing screws (37), tap the blade downwards to achieve the radial clearance stated in the technical specification sheet. Tighten all fixing screws and remove feeler gauges. Recheck clearances and check rotor rotates free through 360°. Repeat for remaining blades.
- 13.25 Adjust the end cover adjustment screws as follows; tighten the screws until they are just touching the face of the end cover, refit the extractor screw in the end of the rotor as before, carefully remove the end cover and rotor assembly, pause to adjust the adjustment screws if there is any contact between rotor and body. Vertical adjustment can be made using the stop screw on the face of the end cover support - ensure the locking screw is released before adjustment and is locked after adjustment (horizontal adjustment can only be made by swapping the pivot pin spacers (17); this will not be necessary under normal circumstances). Recheck the adjustment by sliding the rotor in and out until there is no contact between it and the body, ensure the adjustment screw lock nuts are fully tightened and replace the end cover fixings
- 13.26 Replace the extractor tool in its position on the end cover.
- 13.27 Replace the plug (36) in the bearing cover (9).
- 13.28 Refit the motor mounting plate.
- 13.29 Refit the geared motor unit.
- 13.30 Refit the drive guard back plate.
- 13.31 Refit the sprockets, align the face of the sprockets using a straight edge.
- 13.32 Refit the chain, the spring clip should be fitted with the open end trailing.
- 13.33 Adjust the chain so that the total slack is equal to one chain pitch.
- 13.34 Refit drive guard cover.
- 13.35 Refit valve in system, referring to installation instructions as necessary.