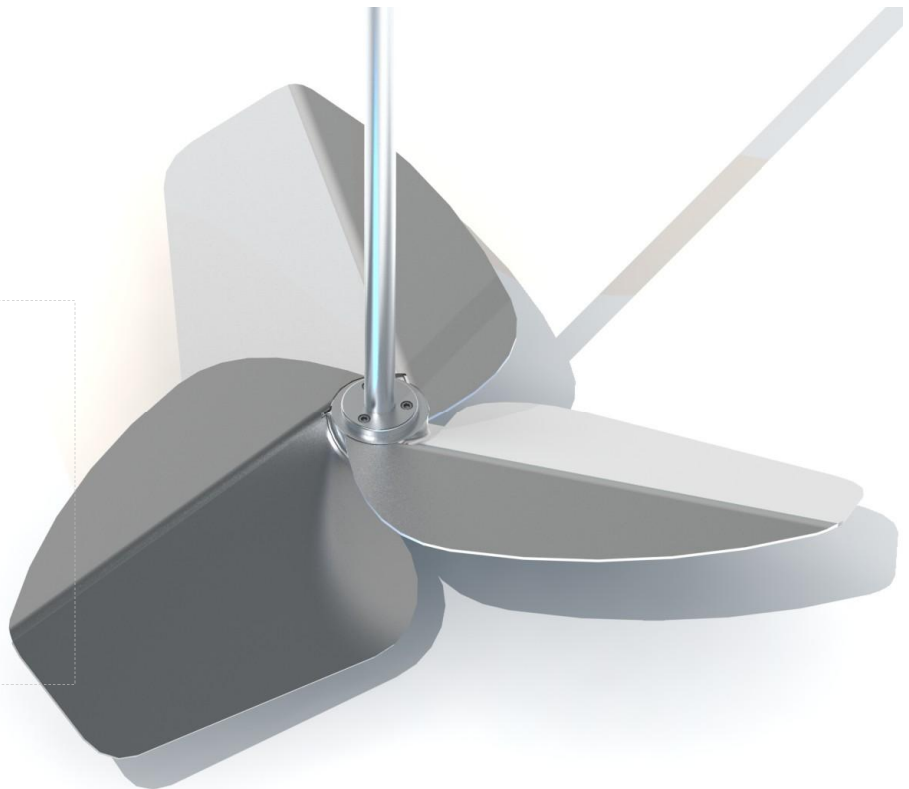

Installation, Operation, and Maintenance Manual

RL-3 Impeller

Equipment Reference:



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A. FIELD ASSISTANCE

National Oilwell Varco (NOV) maintains a fully staffed Parts and Field Service Department dedicated to Chemineer™ equipment that is ready to help you with any service requirement. When in doubt contact your local Chemineer™ office, or Parts/Field Service department at the Chemineer™ Factory:

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For your convenience, NOV offers the following services for Chemineer™ Agitators:

- Installation and maintenance training seminars
- Installation and start-up supervision
- Preventative maintenance planning
- Parts order service

B. SAFETY



B.1. FASTENERS

Important: Critical fasteners should not be reused. Critical fasteners are all those that are used with torque control, for example blade bolts, shaft coupling bolts, pedestal fixing bolts, etc. When a fastener is disturbed, always replace it with a new one. Dispose of used fasteners.

B.2. SAFETY CHECKLIST

- This Installation, Operation and Maintenance Manual, assembly drawings, and any supplements must be reviewed and understood before commencing installation and operation.
- All site rules must be observed for the installation and operation of this mixer.
- Ensure all external connections are made in accordance with applicable codes of practice.
- The mixer must be earthed (connected to ground).
- Correct rotation must be checked prior to operation.
- Do not** exceed the operating pressures, temperatures, and other conditions for which the machine has been designed.
- Do not** operate the agitator unless all guards are securely fixed. Do not modify any guarding. Open tanks fitted with agitators must be provided with suitable guarding to prevent personnel contacting agitator-moving parts. The user is responsible for providing these guards.
- Ensure gas supply system, (if applicable) is correctly installed, pressurized and ready for operation.
- Do not** touch rotating components.
- During servicing of the mixer, the motor must be isolated from the power supply and the supply locked out.
- Do not** operate the mixer for applications other than for its intended use.
- Do not** modify the mixer without reviewing the change with Chemineer. It is unsafe to use non-standard parts without Chemineer's approval. When in doubt, ask your local Chemineer office.

WHEN IN DOUBT, ASK!

C. RL-3 IMPELLER INSTALLATION

NOTE: *The RL-3 impeller is designed to shed fibers off the leading edge of the extension blades. To facilitate this, the leading edge of the RL-3 extension blades are polished to a high degree and need to be adequately protected during shipment, handling, lifting, and installation. Any significant nicks, burrs, or other surface imperfections on the leading edge of the extension blade could decrease the shedding capability of the impeller. Under no circumstance are chains to be slug around the impeller for lifting. USE STRAPS ONLY FOR LIFTING, and protect impeller from nicks, dents, burrs, etc.*

In the case that the hub or an unpolished area of the impeller's extension blade is damaged during installation, the nick, dent, burr, etc. will need to be ground down to a smooth transition. If the polished leading edge of the extension blade is damaged, grind to remove the nick, dent, burr, etc without altering the profile of the leading edge's slope, then polish to a 30 Ra (maximum).

1. Install top hub cap [535], if furnished, onto the top of the impeller hub [504] with socket-head cap screws [537]. Do not tighten cap screws at this point.
2. Slide hub [504] up agitator extension shaft [400] past the desired key location.
3. Install pin key [402] in the shaft keyway so that the pin extends into the drilled hole in the keyway. Slide the hub back down the agitator extension shaft, over the key, until the hub rests on the key step.
4. Torque top hub cap fasteners [537] (if supplied) to approximately 38 ft-lb (52 Nm).
5. Tighten socket-head setscrew [505] firmly onto the key. Torque to the value shown in the Appendix. The tapped holes in the hub for the setscrew and cap screws are a self-locking thread form. Auxiliary fastener locking is generally not necessary.
6. Install bottom hub cap [534] onto the bottom of the impeller hub [504] with socket-head cap screws [536] and torque to approximately 38 ft-lb (52 Nm).
7. It is recommended that common silicon RTV (assuming process compatibility) be applied around the seams between the top cap [535] and shaft [400], the top cap [535] and hub [504], and the bottom cap [534] and hub [504]. It should also be applied in the hub counterbore around any exposed setscrew threads. If the top hub cap is not equipped, apply silicon RTV in the seam between the shaft and hub, including around the exposed key.

NOTE: *Although extensive lab tests of the RL-3 impeller shows no indication that these areas will catch fibers, any crevice does have the potential to catch fibers. Therefore, it is recommended that this step be taken as a preventative measure.*

NOTE: *Hub caps 534 and 535 are not furnished on all units.*

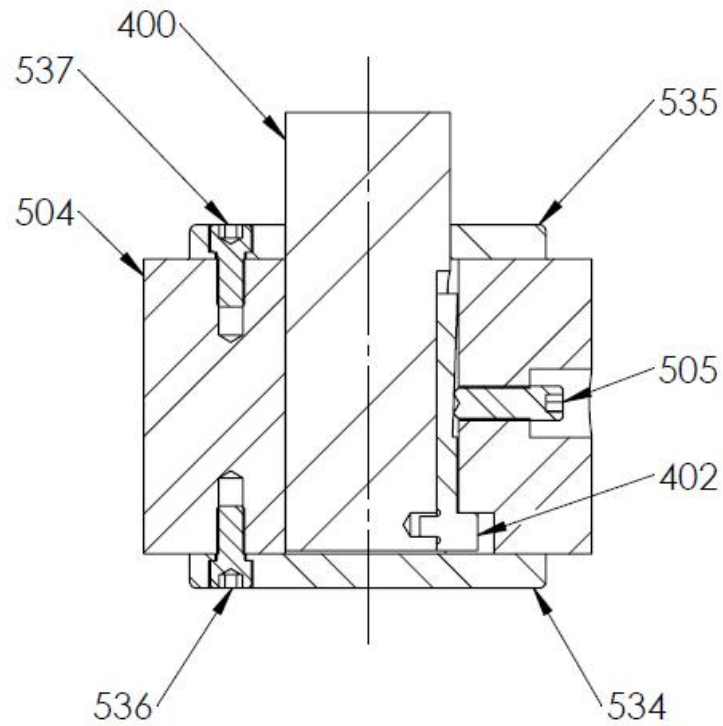


Figure 1: RL-3 Hub, Caps, and Pin Key Detail

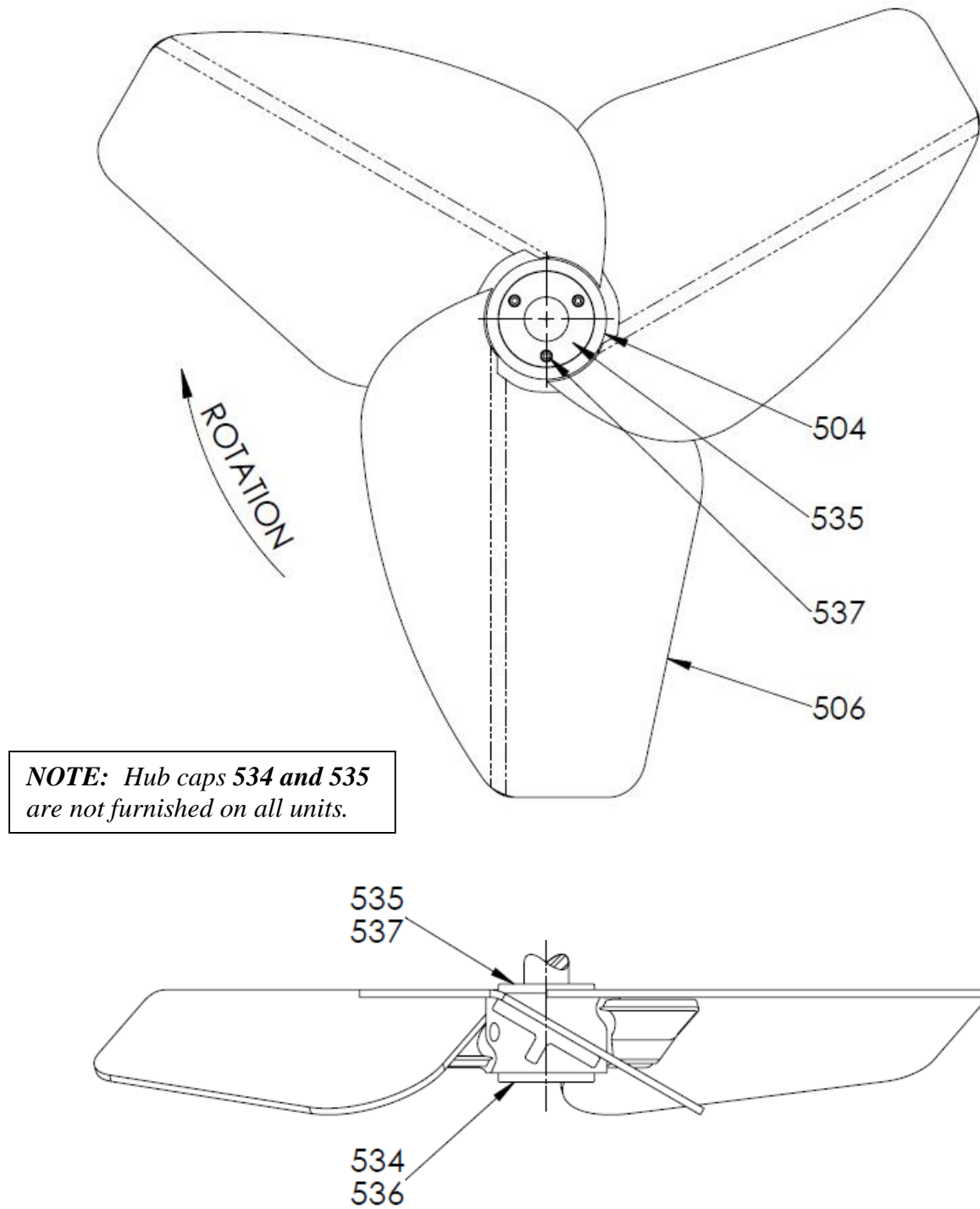


Figure 2: Style RL-3 Impeller

D. ITEM LIST

| Item# | Description | Qty. |
|--------------|---------------------------------|-------------|
| 400 | Extension shaft assembly | 1 |
| 402 | Pin key | 1 |
| 500 | Impeller assembly | 1 |
| 504 | Hub | 1 |
| 505 | Setscrew | 1 |
| 506 | Extension blade | 3 |
| 533 | Impeller assembly RL-3 | 1 |
| 534 | Bottom hub cap | 1 |
| 535 | Top hub cap | 1 |
| 536 | Bottom hub cap bolt | 3 |
| 537 | Top hub cap bolt | 3 |

E. APPENDIX**E.1. BOLT AND SETSCREW TIGHTENING TORQUE**

Tighten all fasteners to values shown unless specifically instructed to do otherwise. Lubricate all fasteners at assembly with thread lubricant or an anti-seize material. Bolt threads and contact surfaces of bolt heads and nuts should be lubricated. Note that stainless steel and alloy fasteners can gall while being tightened. The risk of galling or thread seizing is reduced by using lubrication, by tightening fasteners with low rpm's and without interruptions, and applying only light pressure. Dry fasteners, components with dirt or dust, bolting faces with rough finish, or even some environmental factors such as heat or moisture can effect the torque readings, and require values different than those listed in the table below.

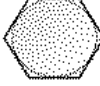
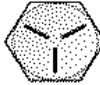

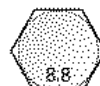
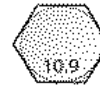
Table 1: Bolt Tightening Torque

| BOLT SIZE | SAE J429 CARBON STEEL | | | | | | STAINLESS STEEL | |
|--------------|-----------------------------|-----|-----------------------------|------|----------------------|-----|---|------|
| | GRADE 2 METRIC GRADE 4.6 | | GRADE 5 METRIC GRADE 8.8 | | METRIC GRADE 12.9 | | 300 Series Stainless Steel (e.g. 304, 316) | |
| | ft-lb | Nm | ft-lb | Nm | ft-lb | Nm | ft-lb | Nm |
| 1/4 - 20 | - | - | 6 | 8.1 | - | - | 4.1 | 5.6 |
| 5/16 - 18 | - | - | 13 | 18 | - | - | 8 | 11 |
| 3/8 - 16 | - | - | 23 | 31 | - | - | 15 | 20 |
| 1/2 - 13 | 38.0 | 52 | 55 | 75 | - | - | 38 | 52 |
| 9/16 - 12 | 50.0 | 68 | 79 | 107 | - | - | 50 | 68 |
| 5/8 - 11 | 68.0 | 92 | 110 | 149 | - | - | 68 | 92 |
| 3/4 - 10 | 120.0 | 163 | 195 | 264 | - | - | 95 | 129 |
| 7/8 - 9 | 122.0 | 165 | 314 | 426 | - | - | 153 | 207 |
| 1 - 8 | 184.0 | 250 | 470 | 637 | - | - | 230 | 312 |
| 1-1/8 - 7 | 260.0 | 353 | 587 | 796 | - | - | 326 | 442 |
| 1-1/4 - 7 | 368.0 | 499 | 828 | 1123 | - | - | 460 | 624 |
| 1-3/8 - 6 | 482.0 | 654 | 1085 | 1471 | - | - | 602 | 816 |
| 1-1/2 - 6 | 640.0 | 868 | 1440 | 1953 | - | - | 800 | 1085 |
| M6 x 1.00 | 3.8 | 5.1 | 6.9 | 9.4 | 9.7 | 13 | 4.3 | 5.8 |
| M8 x 1.25 | 8 | 10 | 17 | 23 | 24 | 32 | 10 | 14 |
| M10 x 1.50 | 15 | 20 | 34 | 45 | 47 | 63 | 21 | 28 |
| M12 x 1.75 | 26 | 35 | 58 | 79 | 81 | 110 | 36 | 49 |
| M16 x 2.00 | 64 | 87 | 145 | 196 | 202 | 274 | 89 | 121 |
| M20 x 2.50 | 126 | 170 | 282 | 383 | 394 | 534 | 174 | 236 |
| M24 x 3.00 | 217 | 295 | 489 | 663 | 537 | 728 | 300 | 407 |

Table 2: Bolt Tightening Torque (Cont'd)

| BOLT SIZE | ALLOY 600 (UNS#N06600), ALLOY C4 (UNS#N06455), ALLOY G30 (UNS#N06030), ALLOY 2205 (UNS#S32205) | | ALLOY C276 (UNS#N10276), ALLOY C2000 (UNS#N06200) | | ALLOY 20 (UNS#N08020), ALLOY 400 (UNS#N04400), ALLOY 825 (UNS#N08825) | |
|----------------------|---|------|---|------|---|------|
| | ft-lb | Nm | ft-lb | Nm | ft-lb | Nm |
| 1/4 - 20 | 4 | 5.4 | 5 | 6.8 | 3.4 | 4.6 |
| 5/16 - 18 | 8 | 11 | 10 | 14 | 7 | 9 |
| 3/8 - 16 | 15 | 20 | 18 | 25 | 12 | 17 |
| 1/2 - 13 | 36 | 49 | 45 | 61 | 30 | 41 |
| 9/16 - 12 | 52 | 70 | 65 | 88 | 43 | 59 |
| 5/8 - 11 | 72 | 97 | 89 | 121 | 60 | 81 |
| 3/4 - 10 | 127 | 172 | 159 | 215 | 106 | 143 |
| 7/8 - 9 | 205 | 277 | 256 | 347 | 170 | 231 |
| 1 - 8 | 307 | 416 | 383 | 520 | 256 | 346 |
| 1-1/8 - 7 | 435 | 589 | 543 | 737 | 362 | 491 |
| 1-1/4 - 7 | 613 | 832 | 767 | 1040 | 511 | 693 |
| 1-3/8 - 6 | 804 | 1090 | 1005 | 1363 | 670 | 908 |
| 1-1/2 - 6 | 1067 | 1447 | 1334 | 1809 | 889 | 1206 |
| M6 x 1.00 | 3.7 | 5.0 | 4.9 | 6.6 | 3.1 | 4.2 |
| M8 x 1.25 | 9 | 12 | 12 | 16 | 7 | 10 |
| M10 x 1.50 | 18 | 24 | 24 | 32 | 15 | 20 |
| M12 x 1.75 | 31 | 42 | 41 | 56 | 26 | 35 |
| M16 x 2.00 | 77 | 104 | 102 | 139 | 64 | 87 |
| M20 x 2.50 | 150 | 203 | 200 | 271 | 125 | 169 |
| M24 x 3.00 | 276 | 374 | 345 | 468 | 216 | 292 |

Table 3: Bolt Grades and Mechanical Properties

| Head Marking | Grade and Material | Nominal Size Range (inches) | Mechanical Properties | | |
|--|---|-----------------------------|-----------------------|-------------------------------------|-----------------------------|
| | | | Proof Load (psi) | Min. Yield Strength (psi) | Min. Tensile Strength (psi) |
| US Bolts | | | | | |
|  No Markings | Grade 2 Low or medium carbon steel | 1/4 thru 3/4 | 55,000 | 57,000 | 74,000 |
| | | Over 3/4 thru 1-1/2 | 33,000 | 36,000 | 60,000 |
|  3 Radial Lines | Grade 5 Medium Carbon Steel, Quenched and Tempered | 1/4 thru 1 | 85,000 | 92,000 | 120,000 |
| | | Over 1 thru 1-1/2 | 74,000 | 81,000 | 105,000 |
|  6 Radial Lines | Grade 8 Medium Carbon Alloy Steel, Quenched and Tempered | 1/4 thru 1-1/2 | 120,000 | 130,000 | 150,000 |
| Stainless markings vary. Most stainless is non-magnetic | 18-8 Stainless Steel alloy with 17-19% Chromium and 8-13% Nickel | 1/4 thru 5/8 | | 40,000 Min. 80,000 – 90,000 Typical | 100,000 – 125,000 Typical |
| | | 3/4 thru 1 | | 40,000 Min. 45,000 – 70,000 Typical | 100,000 Typical |
| | | Above 1 | | | 80,000 – 90,000 Typical |
| Head Marking | Class and Material | Nominal Size Range (mm) | Mechanical Properties | | |
| | | | Proof Load (MPa) | Min. Yield Strength (MPa) | Min. Tensile Strength (MPa) |
| Metric bolts | | | | | |
|  8.8 | Class 8.8 Medium Carbon Steel, Quenched and Tempered | All Sizes below 16mm | 580 | 640 | 800 |
| | | 16mm - 72mm | 600 | 660 | 830 |
|  10.9 | Class 10.9 Alloy Steel, Quenched and Tempered | 5mm - 100mm | 830 | 940 | 1040 |
| 12.9 | Class 12.9 Alloy Steel, Quenched and Tempered | 1.8mm - 100mm | 970 | 1100 | 1220 |
| Stainless markings vary. Most stainless is non-magnetic. Usually stamped A-2 | A-2 Stainless Steel alloy with 17- 19% Chromium and 8-13% Nickel | All Sizes thru 20mm | | 210 Min. 450 Typical | 500 Min. 700 Typical |
| Tensile Strength: The maximum load in tension (pulling apart) which a material can withstand before breaking or fracturing. | | | | | |
| Yield Strength: The maximum load at which a material exhibits a specific permanent deformation | | | | | |
| Proof Load: An axial tensile load which the product must withstand without evidence of any permanent set. | | | | | |
| 1MPa = 1N/mm ² = 0.2248 pounds/mm ² | | | | | |

(Source: www.boltdepot.com)



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