

# INSTRUCTIONS FOR USE

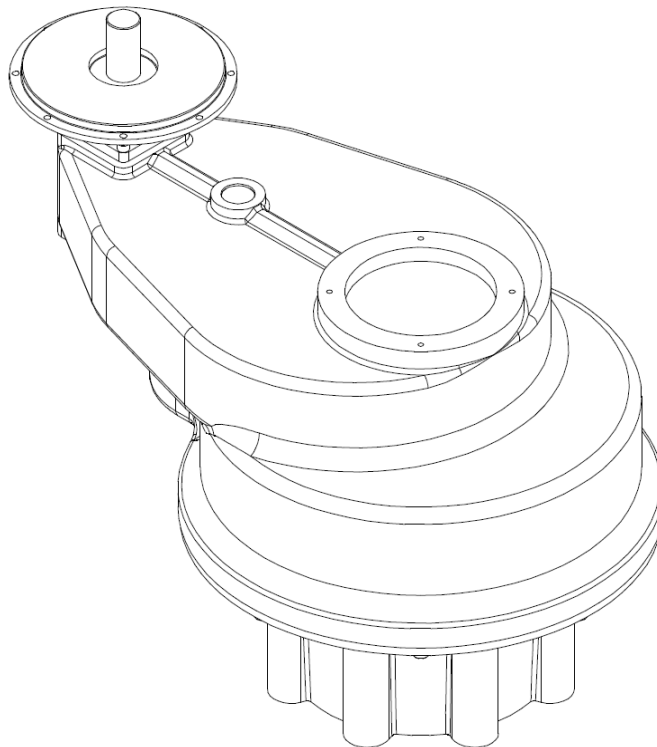
## SPUR GEAR OPERATORS

Spur Range Specification:

Installation, Operating and Maintenance Instructions:

Assembly and Dismantling Instructions:

Spare Parts List and Recommended 5 Years Holding List:



ROTORK GEARS  
REGINA HOUSE  
RING ROAD  
BRAMLEY  
LEEDS  
LS13 4ET  
WEST YORKSHIRE  
ENGLAND

## ROTORK GEARS SPUR RANGE SPECIFICATION

Component	Material Specification										
<b>Gearcase</b>	Cast Iron as standard, optional SG Iron, Carbon Steel or Stainless Steel.										
<b>Baseplate</b>	SG iron as standard, optional cast Iron, Carbon Steel or Stainless Steel.										
<b>Input Housing</b>	Cast Iron as standard, optional SG Iron, Carbon Steel or Stainless Steel.										
<b>Bevel gear</b>	SG Iron or carbon steel										
<b>Pinion gear and shaft</b>	Carbon steel, optional Stainless Steel.										
<b>Spigot ring</b>	SG Iron as standard, optional Cast Iron.										
<b>Screws</b>	High Tensile Steel Metric Standard to BS3692 & 4168 as standard, optional Stainless Steel.										
<b>Bearings</b>	Input Shaft – Ball type. Thrust Output – Needle roller type with thrust washers (with the exception of size 14, which has cylindrical roller thrust bearings and RAB, which have taper roller bearing)										
<b>Output Sleeve A1</b> (for non-rising valve spindles)	Steel										
<b>Output Sleeve A1</b> (for non-rising valve spindles)	Aluminium Bronze.										
<b>Finish</b>	PE3 Pennine Primer (Standard). Primer and Enamel Gloss (Optional). Other finishes available on request.										
<b>Lubricant</b>	<table style="width: 100%; border: none;"> <tr> <td style="width: 60%;">RENOLIT CL-X2 (Standard) max temp 95°C:</td> <td>Flash point &gt; 100°C</td> </tr> <tr> <td>RENOLIT LX-EP2 (High temp) max temp 160°C:</td> <td>F lash point &gt; 100°C</td> </tr> <tr> <td>CASSIDA EPS 2 (Food) max temp 177°C:</td> <td>Flash point &gt; 100°C</td> </tr> <tr> <td>RENOLIT MO2 (Graphite) max temp 120°C:</td> <td>Flash point &gt; 100°C</td> </tr> <tr> <td>MOV LL (Nuclear) max temp 150 °C:</td> <td>Flash point &gt; 180°C</td> </tr> </table>	RENOLIT CL-X2 (Standard) max temp 95°C:	Flash point > 100°C	RENOLIT LX-EP2 (High temp) max temp 160°C:	F lash point > 100°C	CASSIDA EPS 2 (Food) max temp 177°C:	Flash point > 100°C	RENOLIT MO2 (Graphite) max temp 120°C:	Flash point > 100°C	MOV LL (Nuclear) max temp 150 °C:	Flash point > 180°C
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<b>Seals</b>	<table style="width: 100%; border: none;"> <tr> <td style="width: 60%;">Nitrile (Standard) max temp 150°C:</td> <td>Ignition temperature &gt; 300°C</td> </tr> <tr> <td>Viton (High temp/ Nuclear) max temp 200°C:</td> <td>Ignition temperature &gt; 315°C</td> </tr> <tr> <td>Fluorosilicone (Low temp) max temp 225°C</td> <td>Ignition temperature &gt; 300°C</td> </tr> <tr> <td>Silicone sealant max temp 260°C:</td> <td>Ignition temperature &gt; 450°C</td> </tr> </table>	Nitrile (Standard) max temp 150°C:	Ignition temperature > 300°C	Viton (High temp/ Nuclear) max temp 200°C:	Ignition temperature > 315°C	Fluorosilicone (Low temp) max temp 225°C	Ignition temperature > 300°C	Silicone sealant max temp 260°C:	Ignition temperature > 450°C		
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Silicone sealant max temp 260°C:	Ignition temperature > 450°C										

Gearbox Detail	Gearbox Specification
<b>Gearbox design Life</b>	850 hours ( 20 minutes a day for 7 years)
<b>Gears</b>	Designed basically to BS545
<b>Gearbox type</b>	Indicated on the nameplate
<b>Gearbox ratio</b>	Indicated on the nameplate
<b>Maximum output torque</b>	Indicated in the Rotork Gears catalogue
<b>Maximum thrust</b>	Indicated in the Rotork Gears catalogue
<b>Gearbox duty specification</b>	Indicated on the nameplate
<b>Nameplate Explosion Marking and Category</b>	According to 94/9/EC and indicated on the nameplate
<b>Maximum speed for the input shaft</b>	350 rpm
<b>Maximum bending moment on the input flange</b>	F10: 108Nm F14: 139Nm F16: 225Nm F25: 763Nm F30: 817Nm
<b>Maximum operating temperature</b>	Indicated on the nameplate
<b>Gearbox weight</b>	Indicated on the nameplate

## INSTALLATION, OPERATING AND MAINTENANCE INSTRUCTIONS FOR SPURS GEAR OPERATORS

The Rotork Gears Spur Range Specification sheets indicate the materials of construction and information for putting the equipment into service. The gearbox is marked according to 94/9/EC with the temperature class and explosion group on the equipment and this shall be observed when installing and operating the equipment. The

user alone is responsible for the appropriate use of the gearbox in consideration of the basic conditions existing at the plant.

This range of gearboxes is supplied to suit the order requirements but, unless specifically requested at the ordering stage, the output sleeve will be supplied blank and must be machined to suit the equipment to be operated.

A thrust element retention device is normally fitted to the baseplate for transporting purposes and **MUST** be removed to access the output sleeve. The output sleeve can be easily removed from the gearbox by first removing the loose piece spigot ring from the baseplate. It is imperative that the thrust bearings in the output are re-assembled correctly, along with the output sleeve and the spigot ring - That is: models that use needle roller thrust bearings **MUST** have a thrust washer at each side of the needle race. A bearing / washer assembly **MUST** be fitted at each side of the output sleeve thrust shoulder. Models with taper roller bearings **MUST** be assembled with the bearings correctly orientated. All thrust elements and bearing cavities must be packed with grease of the correct specification.

#### **NOTES FOR MOUNTING TO THE VALVE**

1. The valve spindle must be greased before assembly of the gearbox to the valve.
2. Thrust element retention device to be removed prior to assembly to the valve.
3. Do not pack the spindle cover tube with grease as this can lead to pressure build up in the gearbox.
4. Flanges to be sealed on assembly with silicone sealant.
5. Spindle cover tubes and plugs to be sealed with suitable sealant.

If the gearbox has been supplied with a handwheel, it is recommended that this be fitted to the gearbox before mounting on the valve. This will make it easier to rotate the gearing to pick up the start of a thread or key location.

On a keyed valve shaft, once the key and keyway are lined up, the gearbox can be lowered onto the mounting flange and bolted down.

On a screwed valve shaft, rotating the handwheel will cause the gearbox to screw itself down the spindle. Once in the correct position it can be bolted down.

For large gearboxes, IS7 to IS20, we recommend fitting the thrust elements onto the valve prior to fitting the gearbox. The spigot ring and one set of thrust washers and bearings can be placed onto the valve first, then the output sleeve can be screwed down or fitted onto the spindle key, depending on the valve spindle design. The second set of thrust washers and bearings are then fitted. The gearbox then can be lowered onto the valve, taking care that the splines in the output gear and output sleeve do not get damaged.

When bolting the valve to the gearbox we recommend using at least grade 8.8 fasteners, and these **MUST** be torque tightened dependent upon the grade and size used.

If an electric actuator is fitted to the gearbox, a suitable input adaptor will have been supplied. After mounting the actuator to the gearbox, the limit and torque switch settings must be made in accordance with the

manufacturer's instructions. The maximum permitted bending moment on the input adaptor of the gearbox is indicated on the gearbox specification sheet.

## HANDLING

Combined valve, actuator and gearbox must **NOT** be slung from the gearbox.

## MAINTENANCE

All gear cavities are lubricated and sealed for life and the type of grease and seals used within the gearbox is indicated on the nameplate and shown in the material specification. The required maintenance intervals depend on the respective application and will therefore have to be determined by the user dependent on the conditions of use. Annual inspection of the gearbox is recommended, but under normal operating conditions no maintenance is required for the gearbox, but should the valve be taken out of service for overhaul, the gearbox baseplate may be removed and the grease renewed. The baseplate must be sealed using silicone sealant on re-assembly, unless fitted with an O ring. Below is a table for the recommended tightening of screws.

SCREW SIZE	HEXAGON HEAD		SOCKET HEAD		SOCKET CAP WITH NORDLOCK WASHER		DURLOK	
	TORQUE TIGHTNESS (lbs ft)	TORQUE TIGHTNESS (Nm)	TORQUE TIGHTNESS (lbs ft)	TORQUE TIGHTNESS (Nm)	TORQUE TIGHTNESS (lbs ft)	TORQUE TIGHTNESS (Nm)	TORQUE TIGHTNESS (lbs ft)	TORQUE TIGHTNESS (Nm)
M4			2 - 3	3 - 4				
M5			4 - 6	5 - 8				
M6	4 - 6	5 - 8	7 - 10	9 - 13				
M8	10 - 15	13 - 20	16 - 24	21 - 32	18 - 27	24 - 36	30 - 45	40 - 60
M10	19 - 29	26 - 39	32 - 47	42 - 63	35 - 52	47 - 71	57 - 86	77 - 115
M12	34 - 51	46 - 68	55 - 82	74 - 110	60 - 91	82 - 124	101 - 151	135 - 203
M16	84 - 126	113 - 169	136 - 204	182 - 247	148 - 221	200 - 300	246 - 370	330 - 496
M20	170 - 255	231 - 364	266 - 400	357 - 535	289 - 434	392 - 588	476 - 713	638 - 956
M24	294 - 441	399 - 598	460 - 690	616 - 924	502 - 752	680 - 1020	COPY OF FQ 032	

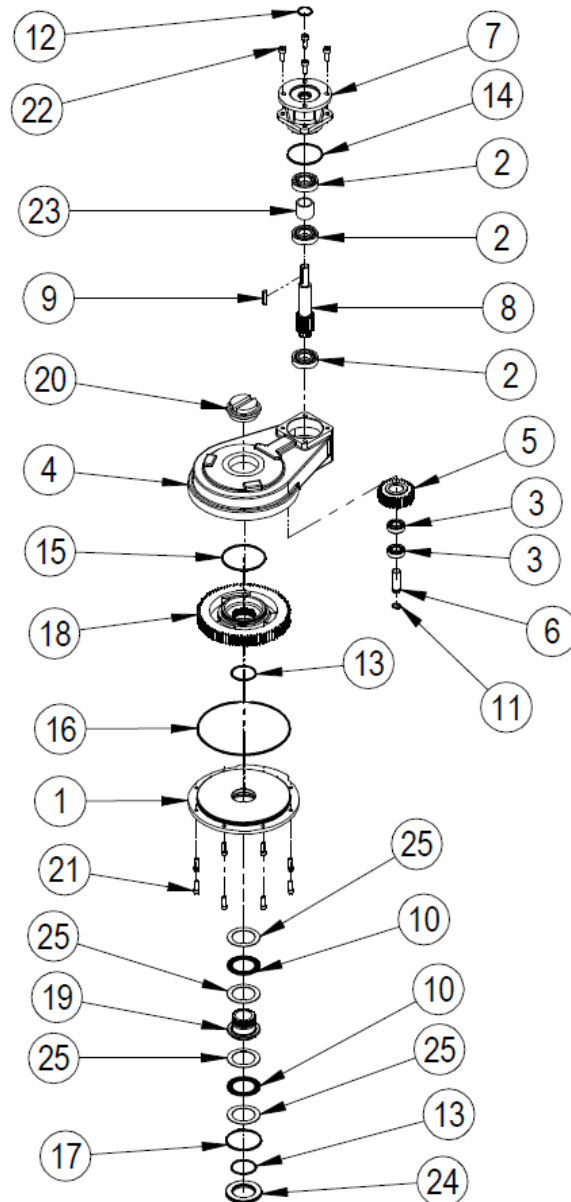
**NB.** All thrust elements and bearing cavities must be re-greased and refitted in the correct order.

## SPARES

Spare parts must be selected from the spare parts lists and a recommended spares holding for 5 years is shown on the spare parts list.

## PROCEDURE FOR DISMANTLING / RE-ASSEMBLY OF SPUR IS2 – IS7 GEAR OPERATORS

- 1. PURPOSE:** To provide dismantling / re-assembly instructions.
- 2. SCOPE:** Rotork Gears range of IS2 – IS7 spur gearboxes
- 3. DEFINITION:** Sequence of instructions to dismantle and re-assemble Rotork Gears spurs gearboxes.
- 4. PROCEDURE:** Refer to spare parts list for item numbers.



EXPLODED VIEW FOR IS2 – IS7 RANGE OF SPUR GEAR OPERATIONS

#### 4.1 Dismantling

- 4.1.1 Remove the key (9) from the input shaft (8).
- 4.1.2 Remove the 4 off screws (22) which secure the input flange (7) to the gearcase (4)
- 4.1.3 For motorised gearbox, remove the input flange from the gearcase complete with 2x bearings (2) and spacer (23)
- 4.1.4 For manual gearbox, remove the input flange from the gearcase complete with bearing (2)
- 4.1.5 Remove the 'o' rings (12 and 14) from the input flange
- 4.1.6 Remove the input shaft and 1x bearing (2) from the gearcase

- 4.1.7 Remove the plug (20) from the gearcase then turnover the gearbox and remove the 8 off screws (21) which secures the baseplate (1) to the gearcase
- 4.1.8 Remove the baseplate, complete with the spigot ring (24), thrust washers (25), thrust bearings (10) and output sleeve (19)
- 4.1.9 Remove the spigot ring, thrust washers and output sleeve from the baseplate
- 4.1.10 Remove the 'o' rings (13) and (17) from the spigot ring
- 4.1.11 Remove the 'o' ring (16) from the baseplate
- 4.1.12 Remove the output gear (18) and idler shaft (6) from gearcase
- 4.1.13 Remove the 'o' rings (13) and (15) from the output gear
- 4.1.14 Remove the idler gear (5) from the gearcase, complete with the 2x bearings (3)
- 4.1.15 Remove the 'o' ring (11) from the idler shaft

## 4.2 Re-assembly

- 4.2.1 Grease and fit 1x bearing (2) into the base of the gearcase (4), where the input shaft will be positioned
- 4.2.2 Grease and fit 2x bearings (2) and spacer (22) (for motorised gearbox) into the input shaft (8) and insert the input shaft subassembly into the gearcase, fit the gear end into the bearing in the gearcase
- 4.2.3 Grease and fit 1x bearings (2) (for manual gearbox) into the input shaft (8) and insert the input shaft subassembly into the gearcase, fit the gear end into the bearing in the gearcase
- 4.2.4 Grease and fit 'o' rings (12) and (14) into the input flange (7) and fit the input flange onto the input shaft, ensure the input shaft protrudes out of the input flange
- 4.2.5 Fit 4 off screws (22) into the input flange to secure input flange to gearcase
- 4.2.6 Fit key (9) into the input shaft and then turnover the gearbox
- 4.2.7 Grease and fit 2x bearings (3) and 'o' ring (11) into the idler shaft (6)
- 4.2.8 Fit idler shaft subassembly into the idler gear (5) and then fit the idler gear subassembly into the gearbox, ensure the idler gear meshes with the input shaft
- 4.2.9 Grease gearcase base and input bore according to the indication of how much grease needs to be put in the gearcase
- 4.2.10 Fit 'o' rings (13) and (15) into the output gear (18)
- 4.2.11 Fit the output gear into the gearcase and ensure it meshes with the idler gear
- 4.2.12 Grease and fit 'o' ring (16) into the baseplate (1) and fit baseplate into the gearcase
- 4.2.13 Fit 8 off screws (21) into the baseplate to secure the baseplate to the gearcase
- 4.2.14 Grease and fit thrust washers (25), thrust bearings (10) and output sleeve (19) into the baseplate
- 4.2.15 Grease and fit 'o' rings (13) and (17) into spigot ring (24) and fit spigot ring into gearcase
- 4.2.16 Turnover the gearbox and fit plug (20) into the gearcase
- 4.2.17 Test the gearbox for free rotation

## 5. DOCUMENTATION

Spare parts list for range of spur gear actuators:  
Torque tightening figures  
Gearbox Installation Manual

IS2 – IS7 Part List.doc  
Document No FQ 032  
RG-INSTALL

## SPARE PARTS LIST FOR IS2 – IS7 RANGE OF SPUR GEAR OPERATORS

ITEM	DESCRIPTION	QUANTITY
1	BASEPLATE	1
*2	BALL BEARING	3 ( 2 FOR MANUAL)
*3	BALL BEARING	2
4	GEARCASE	1
5	IDLER GEAR	1
6	IDLER SHAFT	1
7	INPUT FLANGE	1
8	INPUT SHAFT	1
9	KEY	1
*10	NEEDLE ROLLER BEARING	1
*11	O-RING	1
*12	O-RING	1
*13	O-RING	2
*14	O-RING	2
*15	O-RING	1
*16	O-RING	1
*17	O-RING	1
18	OUTPUT GEAR	1
19	OUTPUT SLEEVE	1
20	PLUG	1
21	SCREW	8
22	SCREW	4
23	SPACER	1
24	SPIGOT RING	1
*25	THRUST WASHER	4
26	GREASE	

Note: Items marked \* are the recommended spares holding for 5 years operation

## PROCEDURE FOR DISMANTLING / RE-ASSEMBLY OF SPUR IS8 – IS14 GEAR OPERATORS

1. **PURPOSE:** To provide dismantling / re-assembly instructions.
2. **SCOPE:** Rotork Gears range of IS8 – IS14 spur gearboxes
3. **DEFINITION:** Sequence of instructions to dismantle and re-assemble Rotork Gears spurs gearboxes.
4. **PROCEDURE:** Refer to spare parts list for item numbers.





- 4.1.4 Remove input gear and key (12) from the input shaft (items 10, 11 and 12 in some occasions depending on ratio can come as one item and therefore can only be removed as an item)
- 4.1.5 Remove the 'o' rings (15) and (16) from the input flange
- 4.1.6 Turnover the gearbox and remove the 4 off screws (26) which supports the endcap (5) to the gearcase
- 4.1.7 Remove the endcap with 1x bearing (3) from the gearcase
- 4.1.8 Remove the 'o' ring (15) from the endcap
- 4.1.9 Remove the 8 off screws (26) which supports the baseplate (1) to the gearcase
- 4.1.10 Remove the baseplate, complete with the output sleeve (25), spigot ring (29), 2x thrust bearings (14 ) and 4x thrust washers (2)
- 4.1.11 Remove the spigot ring, thrust bearings, thrust washers and output sleeve from the baseplate
- 4.1.12 Remove the 'o' ring (21) from the baseplate
- 4.1.13 Remove the 'o' rings (22) and (23) from the spigot ring
- 4.1.14 Remove the output gear (24) complete with 'o' rings (19) and (20) from the gearcase
- 4.1.15 Remove the 'o' rings (19) and (20) from the output gear
- 4.1.16 Remove the idler shaft (9) from the gearcase
- 4.1.17 Remove the 'o' rings (17) and (18) from the idler shaft
- 4.1.18 Remove the idler gear (8) from the gearcase complete with 4x bearings (4) and spacer (28), the bearings and spacer can be removed from the idler gear

## 4.2 Re-assembly

- 4.2.1 Grease (30) and fit 1x 'o' ring (15) into the endcap (5)
- 4.2.2 Grease endcap cavity and fit 1x bearing (3)
- 4.2.3 Fit endcap subassembly into gearcase (7) then re-secure the endcap to the gearcase with the 4 off screws (26)
- 4.2.4 Grease and fit 1x bearings (4), spacer (28) and 3x bearings (4) into idle gear (8)
- 4.2.5 Grease gearcase base according to the indication of how much grease needs to be put in the gearcase and fit idle gear subassembly into the gearcase locating the idler shaft position
- 4.2.6 Grease and fit 'o' rings (17) and (18) onto the idler shaft (9)
- 4.2.7 Grease idler shaft and fit into idler gear through the gearcase, ensure the idler shaft does not protrude out of the gearcase at either ends
- 4.2.8 Grease and fit 'o' rings (19) and (20) into the output gear (24) and fit output gear into gearcase, ensure the output gear meshes with the idler gear then re-grease to cover the output gear
- 4.2.9 Fit baseplate (1) onto gearcase and re-secure the baseplate to the gearcase using the existing 8 off screws (27), using a diagonal tightening movement.
- 4.2.10 Fit 1x washer (2), 1x bearing (14) and 1x washer (2) into the baseplate
- 4.2.11 Fit output sleeve (25) into the baseplate and repeat 4.2.10
- 4.2.12 Grease and fit 'o' rings (22) and (23) into the spigot ring (29).
- 4.2.13 Fit spigot ring into the baseplate and ensure the spigot ring is flush with the baseplate
- 4.2.14 Turnover the gearbox and grease the cavity of the bearing in the endcap subassembly
- 4.2.15 Fit 1x key (12) into the input shaft (11)

- 4.2.16 Fit input shaft (11) into the input gear (10) and fit the input shaft subassembly into the gearcase, ensure the input gear meshes with the idler gear (in some cases depending on ratio, items 10, 11 and 12 comes as one item and therefore assembled as one item)
- 4.2.17 Grease and fit 'o' rings 1x (15) and (16) into the input flange (6)
- 4.2.18 Grease and fit 1x bearings (2), spacer (27) and 1x bearing (2) into the input flange
- 4.2.19 Fit input flange subassembly into the gearcase, ensure the input shaft protrudes out of the input flange
- 4.2.20 Re-secure input flange to gearcase with existing 4 off screws (26)
- 4.2.21 Fit 1x key (13) into the input shaft
- 4.2.22 Test the gearbox for free rotation

## 5. DOCUMENTATION

Spare parts list for range of spur gear actuators:

IS8 – IS14 Part List.doc

Torque tightening figures

Document No FQ 032

Gearbox Installation Manual

RG-INSTALL

### SPARE PARTS LIST FOR IS8 – IS14 RANGE OF SPUR GEAR OPERATORS

ITEM	DESCRIPTION	QUANTITY
1	BASEPLATE	1
*2	BEARING WASHER	4
*3	BEARING	2
*4	BEARING	4
5	ENDCAP	1
6	ENDCAP	1
7	GEARCASE	1
8	IDLER GEAR	1
9	IDLER SHAFT	1
10	INPUT GEAR	1
11	INPUT SHAFT	1
12	KEY	1
13	KEY	1
14	THRUST BEARING	2
*15	O-RING	2
*16	O-RING	1
*17	O-RING	1
*18	O-RING	1
*19	O-RING	1
*20	O-RING	1
*21	O-RING	1
*22	O-RING	1
*23	O-RING	1

24	OUTPUT GEAR	1
25	OUTPUT SLEEVE	1
26	SCREW	8
27	SCREW	8
28	SPACER	1
29	SPIGOT RING	1
30	GREASE	

Note: items marked \* are the recommended spares holding for 5 years operation.

## PROCEDURE FOR DISMANTLING / RE-ASSEMBLY OF SPUR IS15 – IS20 GEAR OPERATORS

1. **PURPOSE:** To provide dismantling / re-assembly instructions.
2. **SCOPE:** Rotork Gears range of IS15 – IS20 spur gearboxes
3. **DEFINITION:** Sequence of instructions to dismantle and re-assemble Rotork Gears spurs gearboxes.
4. **PROCEDURE:** Refer to spare parts list for item numbers.

### 4.1 Dismantling

- 4.1.1 Remove key (13) from the input shaft (11).
- 4.1.2 Remove the 4 off screws (26) which secure the input flange (9) to the gearcase (5)
- 4.1.3 Remove the input flange (9) from the gearcase complete with 2x bearings (2), spacer (28) and 1x 'o' rings (15) and (16)
- 4.1.4 Remove the bearings, spacer and 'o' rings from the input flange
- 4.1.5 Remove the input shaft from the gearcase complete with input gear (10) and key (12)
- 4.1.6 Remove the key and input gear from the input shaft (items 10, 11 and 12 in some occasions depending on ratio can come as one item and therefore can only be removed as an item)
- 4.1.7 Turnover the gearbox and remove the 4 off screws (26) which supports the endcap (4) to the gearcase
- 4.1.8 Remove the endcap with 1x bearing (2) from the gearcase
- 4.1.9 Remove 1x 'o' ring (15) from the endcap
- 4.1.10 Remove the 8 off screws (27) which supports the baseplate (1) to the gearcase
- 4.1.11 Remove the baseplate, complete with the output sleeve (25), spigot ring (30), 2x thrust bearings (14 ) and 4x thrust washers (31)
- 4.1.12 Remove the spigot ring, thrust bearings, thrust washers and output sleeve from the baseplate
- 4.1.13 Remove the 'o' rings (21) and (22) from the spigot ring



## 4.2 Re-assembly

- 4.2.1 Grease (6) and fit 1x 'o' ring (15) into the endcap (4)
- 4.2.2 Grease endcap cavity and fit 1x bearing (2)
- 4.2.3 Fit endcap subassembly into gearcase (5) then re-secure the endcap to the gearcase with the 4 off screws (26)
- 4.2.4 Fit the small idler gear (7) into the big idler gear (7) (these sometimes come as one item depending on ratio)
- 4.2.5 Grease and fit 2x bearings (3), spacer (29) and 4x bearings (3) into idle gear from the gear end
- 4.2.6 Grease gearcase base according to the indication of how much grease needs to be put in the gearcase and fit idle gear subassembly into the gearcase locating the idler shaft position
- 4.2.7 Grease and fit 'o' rings (17) and (18) onto the idler shaft (8)
- 4.2.8 Grease idler shaft and fit into idler gear through the gearcase, ensure the idler shaft does not protrude out of the gearcase at either ends
- 4.2.9 Grease and fit 'o' ring (19) into the output hub (24) and fit output hub into gearcase
- 4.2.10 Grease gearcase base according to the indication of how much grease needs to be put in the gearcase
- 4.2.11 Grease and fit 'o' ring (20) into the output gear (23) and fit output gear into output hub, ensure the output gear meshes with the idler gear then re-grease to cover the output gear
- 4.2.12 Fit baseplate (1) onto gearcase and re-secure the baseplate to the gearcase using the existing 8 screws (27), using a diagonal tightening movement.
- 4.2.13 Fit 1x thrust washer (31), 1x thrust bearing (14) and 1x thrust washer (31) into the baseplate
- 4.2.14 Fit output sleeve (25) into the baseplate and repeat 4.2.13
- 4.2.15 Grease and fit 'o' rings (21) and (22) into the spigot ring (30).
- 4.2.16 Fit spigot ring into the baseplate and ensure the spigot ring is flush with the baseplate
- 4.2.17 Turnover the gearbox and grease the cavity of the bearing in the endcap subassembly
- 4.2.18 Fit 1x key (12) into the input shaft (11)
- 4.2.19 Fit input shaft (11) into the input gear (10) and fit the input shaft subassembly into the gearcase, ensure the input gear meshes with the idler gear (in some cases depending on ratio, items 10, 11 and 12 comes as one item and therefore assembled as one item)
- 4.2.20 Grease and fit 1x 'o' rings (15) and (16) into the input flange (9)
- 4.2.21 Grease and fit 1x bearings (2), spacer (28) and 1x bearing (2) into the input flange
- 4.2.22 Fit input flange subassembly into the gearcase, ensure the input shaft protrudes out of the input flange
- 4.2.23 Re-secure input flange to gearcase with the 4x off screws (26)
- 4.2.24 Fit 1x key (13) into the input shaft
- 4.2.25 Test the gearbox for free rotation

## 5 DOCUMENTATION

Spare parts list for range of spur gear actuators:  
Torque tightening figures  
Gearbox Installation Manual

IS15 – IS20 Part List.doc  
Document No FQ 032  
RG-INSTALL

## SPARE PARTS LIST FOR IS15 - IS20 RANGE OF SPUR GEAR OPERATORS

ITEM	DESCRIPTION	QUANTITY
1	BASEPLATE	1
*2	BALL BEARING	3
*3	BALL BEARING	6, 4 (IS15-IS17)
4	ENDCAP	1
5	GEARCASE	1
6	GREASE	
7	IDLER GEAR	1
8	IDLER SHAFT	1
9	INPUT FLANGE	1
10	INPUT GEAR	1
11	INPUT SHAFT	1
12	KEY	1
13	KEY	1
*14	THRUST BEARING	2
*15	O-RING	2
*16	O-RING	1
*17	O-RING	1
*18	O-RING	1
*19	O-RING	1
*20	O-RING	1
*21	O-RING	1
*22	O-RING	1
23	OUTPUT GEAR	1
24	OUTPUT HUB	1
25	OUTPUT SLEEVE	1
26	SCREW	8
27	SCREW	8
28	SPACER	1
29	SPACER	1
30	SPIGOT RING	1
31	THRUST WASHER	4

Note: items marked \* are the recommended spares holding for 5 years operation.