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,
Bramley,
Leeds,
LS13 4ET,
England.

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

The Rotork Gears Spur and Bevel 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. NTB and IB-B700D02 gearboxes do not have a removable output sleeve.

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, IB8 to IB14 and 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 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.

	HEXAGON HEAD GRADE 8.8		HEXAGON HEAD GRADE 8.8 WITH NORDLOCK WASHER		SOCKET HEAD GRADE 12.9		SOCKET HEAD GRADE 12.9 WITH NORDLOCK WASHER		DURLOK GRADE 12.9 SCREW GRADE 12 NUT	
SCREW SIZE	TORQUE TIGHTNESS (Nm)	TORQUE TIGHTNESS (lbsft)	TORQUE TIGHTNESS (Nm)	TORQUE TIGHTNESS (lbsft)	TORQUE TIGHTNESS (Nm)	TORQUE TIGHTNESS (lbsft)	TORQUE TIGHTNESS (Nm)	TORQUE TIGHTNESS (lbsft)	TORQUE TIGHTNESS (Nm)	TORQUE TIGHTNESS (lbsft)
M4	2	2	3	2	4	3	5	4		
M5	5	4	6	4	8	6	10	7	11	8
M6	9	6	10	8	14	11	17	13	19	14
M8	21	15	25	18	35	26	42	31	45	33
M10	41	30	49	36	69	51	83	61	86	64
M12	71	53	86	63	121	89	145	107	152	112
M16	177	131	213	157	299	221	359	265	372	274
M20	346	255	415	306	584	431	701	517	717	529
M24	598	441	718	529	1009	744	1211	893		
M30					2006	1480			Note: Once fully torque tightened Durlok fasteners must not be re used on Nuclear gearboxes.	
M36					3508	2587				
Copy of QC 40-2										

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.

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

The Rotork Gears Spur and Bevel 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. NTB gearboxes do not have a removable output sleeve.

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, IB8 to IB14 and 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 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.

	HEXAGON HEAD GRADE 8.8		HEXAGON HEAD GRADE 8.8 WITH NORDLOCK WASHER		SOCKET HEAD GRADE 12.9		SOCKET HEAD GRADE 12.9 WITH NORDLOCK WASHER		DURLOK GRADE 12.9 SCREW GRADE 12 NUT	
SCREW SIZE	TORQUE TIGHTNESS (Nm)	TORQUE TIGHTNESS (lbsft)	TORQUE TIGHTNESS (Nm)	TORQUE TIGHTNESS (lbsft)	TORQUE TIGHTNESS (Nm)	TORQUE TIGHTNESS (lbsft)	TORQUE TIGHTNESS (Nm)	TORQUE TIGHTNESS (lbsft)	TORQUE TIGHTNESS (Nm)	TORQUE TIGHTNESS (lbsft)
M4	2	2	3	2	4	3	5	4		
M5	5	4	6	4	8	6	10	7	11	8
M6	9	6	10	8	14	11	17	13	19	14
M8	21	15	25	18	35	26	42	31	45	33
M10	41	30	49	36	69	51	83	61	86	64
M12	71	53	86	63	121	89	145	107	152	112
M16	177	131	213	157	299	221	359	265	372	274
M20	346	255	415	306	584	431	701	517	717	529
M24	598	441	718	529	1009	744	1211	893		
M30					2006	1480			Note: Once fully torque tightened Durlok fasteners must not be re used on Nuclear gearboxes.	
M36					3508	2587				
Copy of QC 40-2										

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 GEAR OPERATORS

1. **PURPOSE:** To provide dismantling / re-assembly instructions.

2. **SCOPE:** Rotork Gears range of spur gearboxes

3. **DEFINITION:** Sequence of instructions to dismantle and re-assemble Rotork Gears spur gearboxes.

4. **PROCEDURE:** Refer to spare parts list for item numbers.

4.1 Dismantling

4.1.1 Remove the key (28) from the input shaft (8).
4.1.2 Remove the 4 off socket head cap screws (25), which secure the input housing (4) to the gearcase (1). The endcap, where used, can also be removed.
4.1.3 Remove the input housing from the gearcase complete with the input shaft, bearings (17) and the spacer (12) where applicable.
4.1.4 Remove the input shaft from the housing. Remove the input gear (9) and key (30) where applicable.
4.1.5 Remove the 8 off socket head cap screws (26), which secure the baseplate (2) to the gearcase.
4.1.6 Remove the baseplate from the gearcase. The output gear (5) will probably remain on the splines of the output sleeve (11).
4.1.7 Remove the output gear from the output sleeve and the output hub (5) from the output gear where applicable.
4.1.8 Remove the spigot ring (10), bearings (16), thrust washers (15) and output sleeve from the baseplate..
4.1.9 Remove the hexagonal head screw (27) where applicable and remove idler shaft (6) from the gearcase.
4.1.10 Remove the idler gear (7) from the gearcase and remove the bearings (18) from the idler gear.
4.1.11 The input gear can be removed from the gearcase if not removed in 4.1.4.

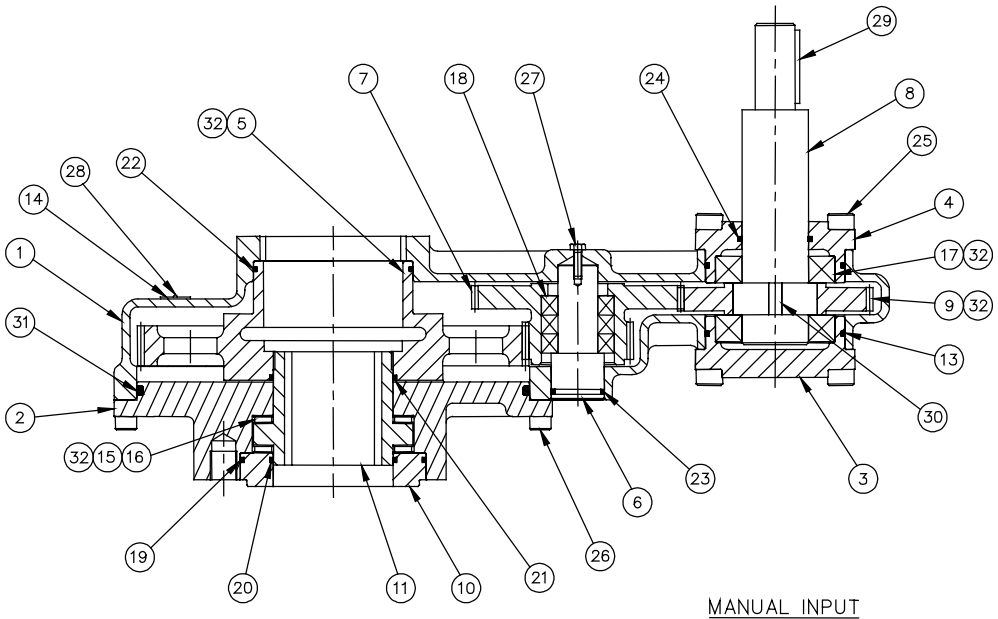
4.2 Re-assembly

4.2.1 Position the input gear in the gearcase if removed in 4.1.10.
4.2.2 Grease and fit the bearings into the idler gear and position in the gearcase.
4.2.3 Fit the ‘o’ ring (23) to the idler shaft and re-fit the idler shaft into the gearcase and the idler gear. Re-secure the hexagonal head screw where applicable.
4.2.4 Ensure that the output gear and baseplate are free from dirt and bruising and then fit the ‘o’ rings (21 and 22) to the output gear.
4.2.5 Re-pack the gearcase with grease.
4.2.6 Fit the output gear and output hub, where applicable, into the gearcase and locate with the idler gear.
4.2.7 Fit the ‘o’ ring (31) to the baseplate and re-secure the baseplate to the gearcase using the existing screws (26) by using a diagonal tightening movement.
4.2.8 Reassemble the input housing sub assembly with the input shaft, input gear, key spacer and bearings ensuring are parts are clean and repack the housing with grease. Fit ‘o’ rings (13 and 24) to the housing.
4.2.9 Re-fit the input housing sub-assembly into the gearcase ensuring that the input gear locates with the idler gear.
4.2.10 Secure the input housing to the gearcase with the existing screws (25) using a diagonal tightening movement.
4.2.11 Re-fit the key to the input shaft.
4.2.12 Apply grease to the thrust bearings and washers and re assemble the output sleeve and spigot ring assembly into the baseplate. Ensure that the ‘o’ ring (21) remains undamaged.
4.2.13 Test the gearbox for free rotation.

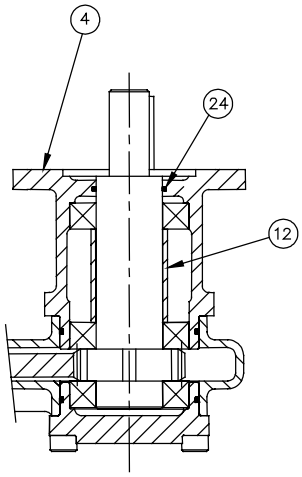
5. DOCUMENTATION

Spare parts list for range of spur gear actuators:	Spur Part List.doc
Torque tightening figures.	Document No QC 40-2

SPARE PARTS LIST FOR RANGE OF SPUR GEAR ACTUATORS



MANUAL INPUT



FLANGE INPUT

ITEM	DESCRIPTION	QUANTITY
1	GEARCASE	1
2	BASEPLATE	1
3	ENDCAP (BLANK)	1 (not used on IS2 to IS5)
4	INPUT HOUSING	1
5	OUTPUT GEAR	1 (IS15-20 has additional Output Hub)
6	IDLER SHAFT	1 (IS6, 7, 10–20 has additional Spacer)
7	IDLER GEAR	1
8	INPUT SHAFT	1 (can be combined with items 9 & 30)
9	INPUT GEAR	1 (can be combined with items 8 & 30)
10	SPIGOT RING	1
11	OUTPUT SLEEVE	1
12	SPACER	1
13	O RING	2 (1 for IS2 to IS5)
14	NAMEPLATE	1
*15	THRUST WASHER	4 (not used on IS14, 16, 18, 19, 20)
*16	THRUST BEARING	2
*17	BALL BEARING	2 (Manual input) or 3 (Flange Input)
*18	BALL BEARING	2 (2-7), 3 (8-11), 4 (12-16), 6 (17-20)
*19	O RING	1
*20	O RING	1
*21	O RING	1
*22	O RING	1
*23	O RING	1
*24	O RING	1
25	SOCKET HEAD CAP SCREW	8 (4 for IS2 to IS5)
26	SOCKET HEAD CAP SCREW	8
27	HEXAGON HEAD SCREW	1 for IS6 & IS7 only
28	RIVET	2
29	KEY	1
30	KEY	1 (can be combined with items 8 & 9)
*31	O RING	1
32	GREASE	

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