

INSTRUCTIONS FOR USE

BEVEL GEAR OPERATORS

Bevel 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.

ROTORK GEARS BEVEL RANGE SPECIFICATION

Component	Material Specification												
Gearcase	Cast Iron as standard, optional SG Iron, Carbon Steel or Stainless Steel.												
Baseplate	SG Iron as standard, optional Cast Iron, Carbon Steel or Stainless Steel.												
Input Housing	Cast Iron as standard, optional SG Iron, Carbon Steel or Stainless Steel.												
Bevel Gear	SG Iron or Carbon Steel.												
Pinion Gear & Shaft	Carbon Steel as standard, optional Stainless Steel.												
Spigot Ring	SG Iron as standard, optional Cast Iron.												
Screws	High Tensile Steel Metric Standard to BS3692 & 4168 as standard, optional Stainless Steel.												
Bearings	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 range, which have taper roller bearings).												
Output Sleeve A1 (for non rising valve spindles)	Steel.												
Output Sleeve A2 (for rising valve spindles)	Aluminium Bronze.												
Finish	PA 24 Grey Primer (Standard). Primer and Enamel Gloss (Optional). Other finishes available on request.												
Lubricant	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">CL-X2 (Standard) max temp 120°C:</td> <td>Ignition temperature > 250°C</td> </tr> <tr> <td>LX-EP2 (High temp) max temp 160°C:</td> <td>Ignition temperature > 250°C</td> </tr> <tr> <td>N0-TOX EP2 (Food) max temp 204°C:</td> <td>Ignition temperature > 250°C</td> </tr> <tr> <td>MO2 (Graphite) max temp 120°C:</td> <td>Flash point > 200°C</td> </tr> <tr> <td>G110 (Nuclear) max temp 150°C:</td> <td>Flash point > 200°C</td> </tr> <tr> <td>G130 (Nuclear) max temp 150°C:</td> <td>Flash point > 200°C</td> </tr> </table>	CL-X2 (Standard) max temp 120°C:	Ignition temperature > 250°C	LX-EP2 (High temp) max temp 160°C:	Ignition temperature > 250°C	N0-TOX EP2 (Food) max temp 204°C:	Ignition temperature > 250°C	MO2 (Graphite) max temp 120°C:	Flash point > 200°C	G110 (Nuclear) max temp 150°C:	Flash point > 200°C	G130 (Nuclear) max temp 150°C:	Flash point > 200°C
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Gearbox Detail	Gearbox Specification										
Gearbox design Life	850 hours (20 minutes a day for 7 years)										
Gears	Designed basically to BS545.										
Gearbox type	Indicated on the nameplate										
Gearbox ratio	Indicated on the nameplate										
Maximum output torque	Indicated in the Rotork Gears catalogue										
Maximum thrust	Indicated in the Rotork Gears catalogue										
Gearbox duty specification	Indicated on the nameplate										
Nameplate Explosion Marking and Category	According to 94/9/EC and indicated on the nameplate										
Maximum speed for the input shaft	350 rpm										
Maximum bending moment on the input flange	<table style="width: 100%; border: none;"> <tr><td>F10:</td><td>66Nm</td></tr> <tr><td>F14:</td><td>178Nm</td></tr> <tr><td>F16:</td><td>210Nm</td></tr> <tr><td>F25:</td><td>700Nm</td></tr> <tr><td>F30:</td><td>770Nm</td></tr> </table>	F10:	66Nm	F14:	178Nm	F16:	210Nm	F25:	700Nm	F30:	770Nm
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F30:	770Nm										
Maximum operating temperature	Indicated on the nameplate										
Gearbox weight	Indicated on the nameplate										

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 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 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	
	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				
M36					3508	2587				

Note: Once fully torque tightened Durlok fasteners must not be re used on Nuclear gearboxes.
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.

C.F. 07.07.06 issue 2

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PROCEDURE FOR DISMANTLING / RE-ASSEMBLY OF BEVEL GEAR OPERATORS

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

4.1 Dismantling

- 4.1.1 Remove the key (17) from the input shaft (5).
- 4.1.2 Remove the 4 off socket head cap screws (20), which secure the input housing (3) to the gearcase (1).
- 4.1.3 Remove the input housing from the gearcase complete with the input shaft, bearings (10) and spacer (11) where applicable.
- 4.1.4 Remove the input shaft from the housing.
- 4.1.5 Remove the 8 off socket head cap screws (21), which secure the baseplate (2) to the gearcase.
- 4.1.6 Remove the baseplate from the gearcase. The bevel gear (4) will probably remain on the splines of the output sleeve (6) for IB, RAB and HOB gearboxes.
- 4.1.7 Remove the bevel gear from the output sleeve on the IB, RAB or HOB, or from the baseplate or gearcase of the NTB gearbox.
- 4.1.8 Remove the spigot ring (7), bearings (8), thrust washers (9), where applicable, and output sleeve from the baseplate of the IB, RAB or HOB gearbox.

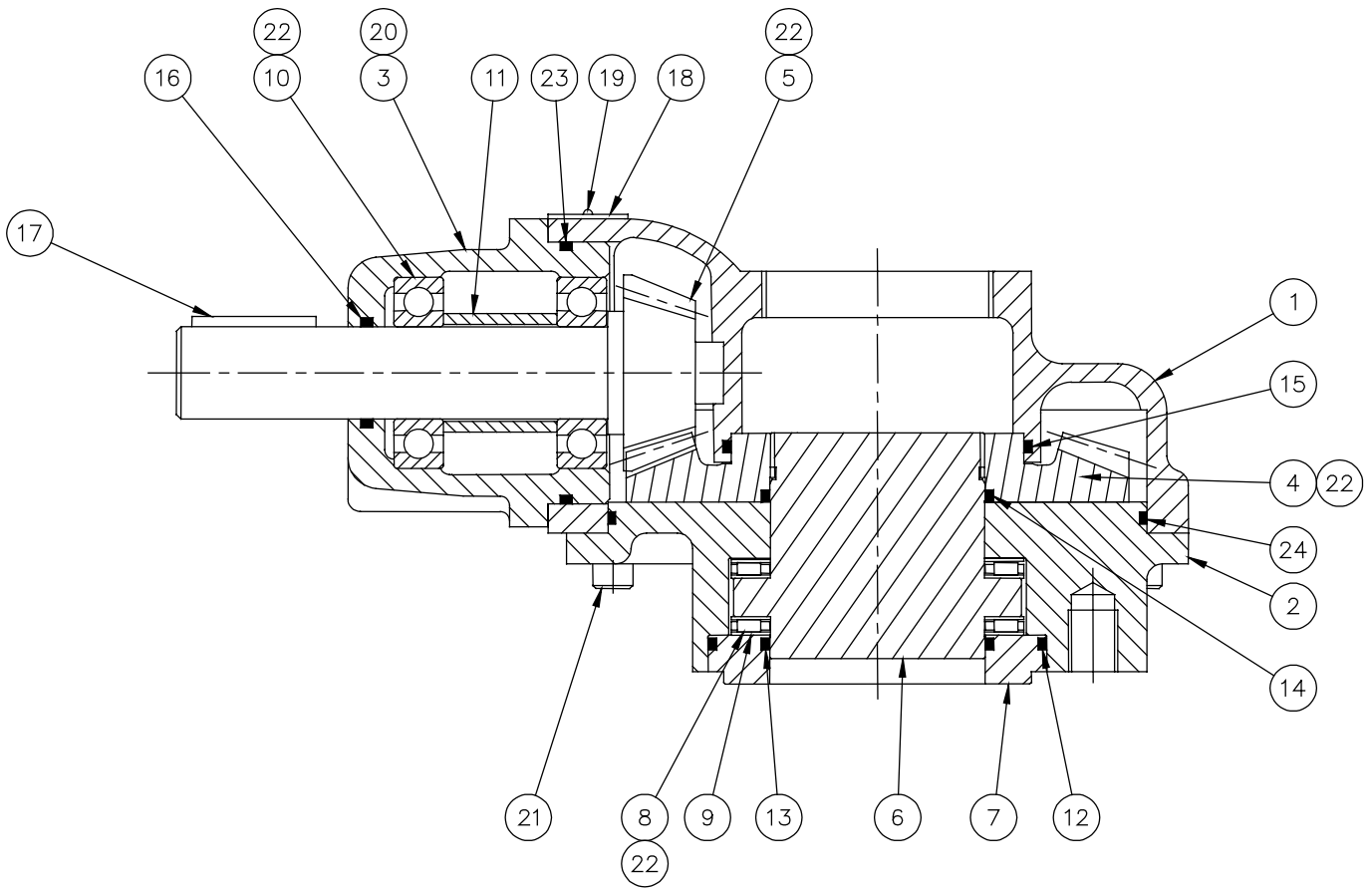
4.2 Re-assembly

- 4.2.1 Ensure the bevel gear and baseplate are free from dirt and bruising and then fit the 'o' ring (14) to the bevel gear.
- 4.2.2 Fit the 'o' ring (15) to the gearcase and re-pack the gearcase with grease (22).
- 4.2.3 Re-fit the output gear into the gearcase ensuring that the 'o' ring (15) remains undamaged.
- 4.2.4 Grease the back face of the bevel gear before re-fitting the baseplate.
- 4.2.5 Fit the 'o' ring (24) to the baseplate and re-fit the baseplate into the gearcase. For the NTB gearbox also fit the 'o' ring (13) onto the output gear prior to fixing the baseplate.
- 4.2.6 Re-secure the gearcase to the baseplate using the existing screws (21) using a diagonal tightening movement.
- 4.2.7 Reassemble the input housing sub assembly with the input shaft, spacer and bearings ensuring are parts are clean and repack the housing with grease. Fit the 'o' rings (16 and 23) in the housing.
- 4.2.8 Re-fit the input housing sub-assembly into the gearcase ensuring that the input shaft gear locates into the bevel gear.
- 4.2.9 Secure the input housing to the gearcase with the existing screws (20) using a diagonal tightening movement.
- 4.2.10 Re-fit the key to the input shaft.
- 4.2.11 For IB, RAB and HOB gearboxes apply grease to the thrust bearings and washers, where applicable, and re assemble the output sleeve and spigot assembly into the baseplate. Ensure that the 'o' ring (14) remains undamaged.
- 4.2.12 Test the gearbox for free rotation.

5. DOCUMENTATION

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

SPARE PARTS LIST FOR RANGE OF BEVEL GEAR OPERATORS



ITEM	DESCRIPTION	QUANTITY
1	GEARCASE	1
2	BASEPLATE	1
3	INPUT HOUSING	1
4	BEVEL GEAR	1
5	INPUT SHAFT & GEAR	1
6	OUTPUT SLEEVE	1 (IB, RAB & HOB only)
7	SPIGOT RING	1 (IB, RAB & HOB only)
* 8	THRUST BEARING	2 (IB, RAB & HOB only)
* 9	THRUST WASHER	4 (IB1-13, & HOB only)
*10	BALL BEARING	2 for IB, & RAB (1 for HOB & NTB)
11	BEARING SPACER	1 (IB, B700D02 & RAB only)
*12	'O' RING	1 (IB, RAB & HOB only)
*13	'O' RING	1 (NOT ON IB-IB700D02)
*14	'O' RING	1 (IB, RAB & HOB only)
*15	'O' RING	1 (NOT ON IB-IB700D02)
*16	'O' RING	1
17	KEY	1
18	NAMEPLATE	1
19	NAMEPLATE RIVET	2
20	SOCKET HEAD CAP SCREW	4
21	SOCKET HEAD CAP SCREW	8 (HEX HEAD ON IB-B700D02)
22	GREASE	
*23	'O' RING	1 (GASKET ON IB-B700D02)
*24	'O' RING	1 (GASKET ON IB-B700D02)

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

PROCEDURE FOR DISMANTLING/ REASSEMBLY OF IB-B700D02 BEVEL GEAR OPERATORS

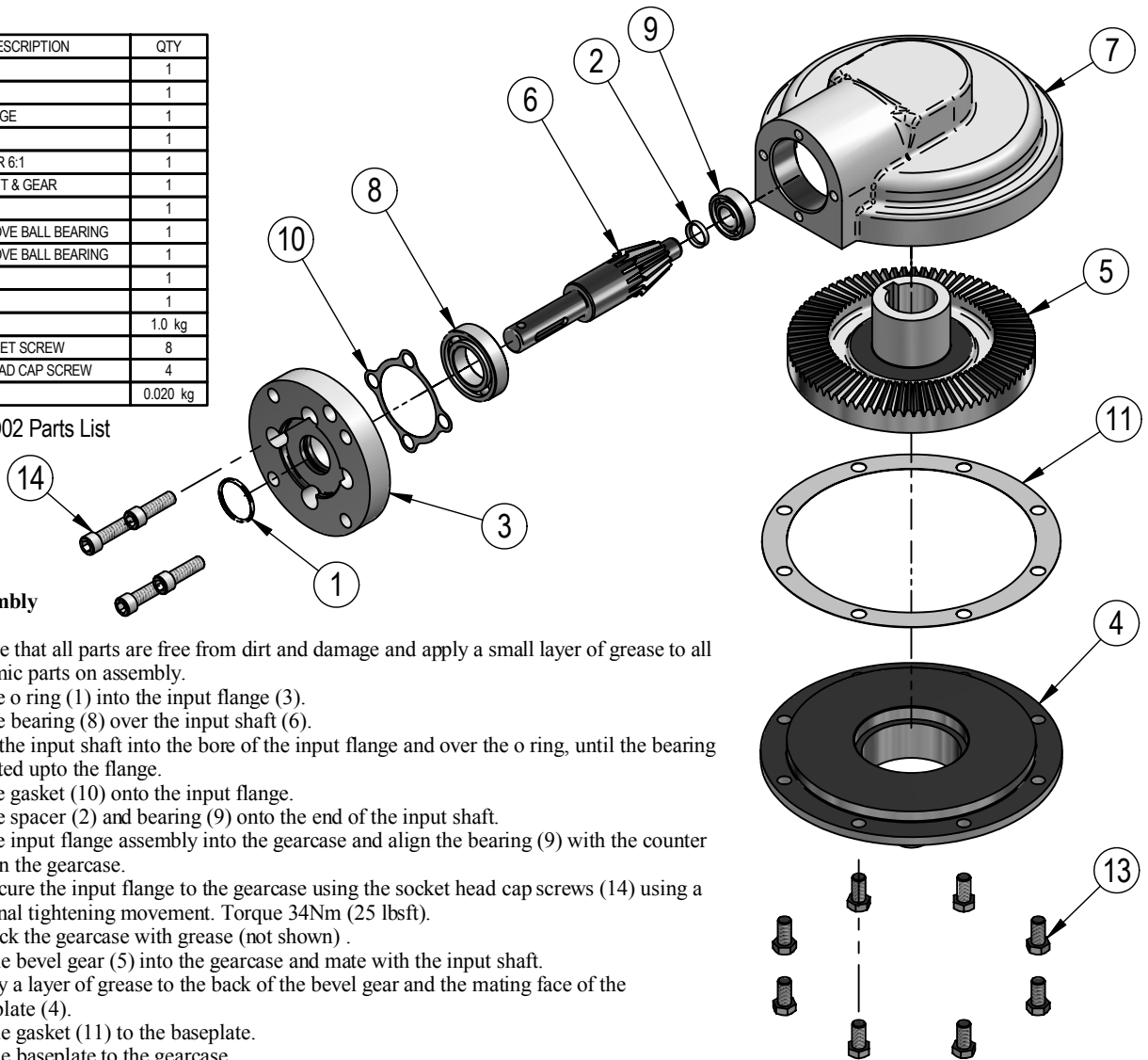
1. **PURPOSE:** To provide dismantling / re- assembly instructions.
2. **SCOPE:** Rotork Gears IB B700D02 bevel gearbox.
3. **DEFINITION:** Sequence of instructions to dismantle and re-assemble Rotork Gears IB B700DF02 bevel gearbox.
4. **PROCEDURE:** Refer to B700D02 parts list for item numbers.

4.1 Dismantling

- 4.1.1 Remove the 4 off socket head cap screws (14), which secure the input flange (3) to the gearcase (7).
- 4.1.2 Remove the input flange from the gearcase complete with the input shaft (6), bearings (8 & 9) and spacer (2).
- 4.1.3 Remove the input shaft from the input flange and the bearings and spacer.
- 4.1.4 Remove the o ring (1) from the input flange.
- 4.1.5 Remove the gasket (10) which will be attached to the gearcase or the input flange.
- 4.1.6 Remove the 8 off hexagon set screws (13), which secures the baseplate (4) to the gearcase.
- 4.1.7 Remove the baseplate from the gearcase.
- 4.1.8 The bevel gear (5) can be removed from either the baseplate or the gearcase.
- 4.1.9 Remove the gasket (11) from the baseplate or the gearcase.

ITEM	DESCRIPTION	QTY
1	O-RING	1
2	SPACER	1
3	INPUT FLANGE	1
4	BASEPLATE	1
5	BEVEL GEAR 6:1	1
6	INPUT SHAFT & GEAR	1
7	GEARCASE	1
8	DEEP GROOVE BALL BEARING	1
9	DEEP GROOVE BALL BEARING	1
10	GASKET	1
11	GASKET	1
12*	GREASE	1.0 kg
13	HEXAGON SET SCREW	8
14	SOCKET HEAD CAP SCREW	4
15*	SUNCORITE	0.020 kg

B700D02 Parts List



4.2 Re-assembly

- 4.2.1 Ensure that all parts are free from dirt and damage and apply a small layer of grease to all dynamic parts on assembly.
- 4.2.2 Fit the o ring (1) into the input flange (3).
- 4.2.3 Fit the bearing (8) over the input shaft (6).
- 4.2.4 Slide the input shaft into the bore of the input flange and over the o ring, until the bearing is butted upto the flange.
- 4.2.5 Fit the gasket (10) onto the input flange.
- 4.2.6 Fit the spacer (2) and bearing (9) onto the end of the input shaft.
- 4.2.7 Fit the input flange assembly into the gearcase and align the bearing (9) with the counter bore in the gearcase.
- 4.2.8 Re-secure the input flange to the gearcase using the socket head cap screws (14) using a diagonal tightening movement. Torque 34Nm (25 lbsft).
- 4.2.9 Re pack the gearcase with grease (not shown).
- 4.2.10 Fit the bevel gear (5) into the gearcase and mate with the input shaft.
- 4.2.11 Apply a layer of grease to the back of the bevel gear and the mating face of the baseplate (4).
- 4.2.12 Fit the gasket (11) to the baseplate.
- 4.2.13 Fit the baseplate to the gearcase.
- 4.2.14 Re-secure the baseplate to the gearcase using the hexagonal set screws (13) using a diagonal tightening movement. Torque 34Nm (25 lbsft).
- 4.2.15 Test the gearbox for free rotation.