

Gearbox Installation Manual

Rotork Gears IW, MOW, MTW, IS and IB ranges

! This manual contains important safety information. Please ensure it is thoroughly read and understood before installing the gearbox.

! This manual is produced to enable a competent person to install the gearbox. Only persons competent by virtue of their training or experience should install, maintain and repair the supplied gearbox.

! The gearbox weight is recorded on the packaging and on a label attached to the gearbox.

! WARNING Gearbox may present an unbalanced load.

! WARNING With respect to handwheel operation of Rotork gearboxes, under no circumstances should any additional lever device such as a wheel-key or wrench be applied to the handwheel in order to develop more force when closing or opening the valve as this may cause damage to the valve and/or gearbox or may cause the valve to become stuck in the seated/backseated position.

! WARNING Damage to protective coatings should be correctly rectified and may invalidate warranty.

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1. Introduction

Unless otherwise specified the gearbox is supplied assembled. In the case of ¼ turn gearboxes, the gearbox stops have been set to a nominal 90° open and close position.

! The IW gearbox stops must be re-set for the stroke of the valve after combination installation.

2. Health and safety

This manual is produced to enable a competent user to install, operate, adjust and inspect Rotork gearboxes. Only persons competent by virtue of their training or experience should install, maintain and repair Rotork gearboxes.

Work undertaken must be carried out in accordance with the instructions in this and any other relevant manuals. The user and those persons working on this equipment should be familiar with their responsibilities under any statutory provisions relating to the Health and Safety of their workplace. Due consideration of additional hazards should be taken when using the gearbox with other equipment. Should further information and guidance relating to the safe use of the Rotork products be required, it will be provided on request.

The mechanical installation should be carried out as outlined in this manual and also in accordance with relevant standards such as British Standard Codes of Practice. No inspection or repair should be undertaken unless it conforms to the specific hazardous area certification requirements.

For maintenance of the actuator, refer to the actuator installation and maintenance manual.

! WARNING: Enclosure Materials. The gearbox enclosure may include cast iron, SG iron, carbon steel or stainless steel.

3. Storage

If your gearbox cannot be installed immediately store it in a clean dry place until you are ready to install in situ. Recommended storage temperature range: 0°C to 40°C (32°F – 104°F).

4. Unpacking

Gearboxes are packed in a variety of configurations depending on size, type and quantity of the consignment.

It is the responsibility of the individual unpacking and handling the combination to carry out a risk assessment for the supplied arrangement to ensure safe working. Refer to Section 5 Handling. Packaging material used may include wood, cardboard, polyethylene and steel. Packaging should be recycled according to local regulations.

5. Handling

! Individual weights for gearboxes are recorded on their respective nameplates

! Only trained and experienced personnel should carry out handling. At all times, safe handling must be ensured.

! Each combination must be assessed to identify all risks associated with handling.

! Gearboxes may present an unbalanced load.

! The gearboxes must be fully supported until full valve shaft/stem engagement is achieved and the gearbox is secured to the valve flange.

! Once connected to the valve, each assembly must be assessed on an individual basis for safe handling/lifting. Never lift the complete combination-valve assembly via the gearbox.

! If it is necessary to lift the gearbox using lifting equipment, certified soft slings are recommended. Damage to protective coatings should be correctly rectified and may invalidate warranty.

6. INSTALLATION OF WORM COMBINATIONS

6.1 Output sleeve removal, machining and refitting

Gearbox sizes IW12 to IW16 have an output which will be directly machined as specified with order. All other worm gearbox combinations have a removable output sleeve (1) See Fig. 1. Unless specifically requested at the ordering stage, the output sleeve will be supplied blank and must be machined to suit the valve shaft.

The sleeve can be easily removed from the top of the gearbox by first removing the indicator/cover plate (3) and output sleeve retaining screws (5). These screws are either serrated under their heads or are fitted with serrated washers (4)

! WARNING: Removing retaining screws will result in loss of control of the valve.

O rings (2) are used to seal the indicator plate, output sleeve and retaining screws. Upon final installation on the valve, these screws must be tightened to the correct torque figures as shown on the label on the underside of the indicator or cover plate.

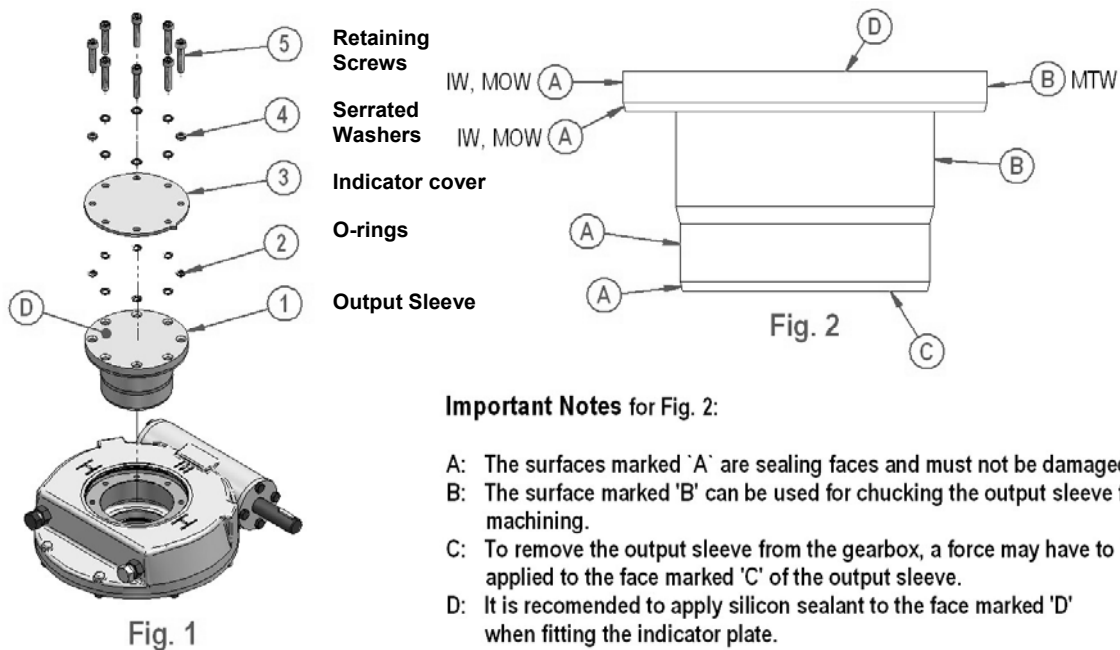


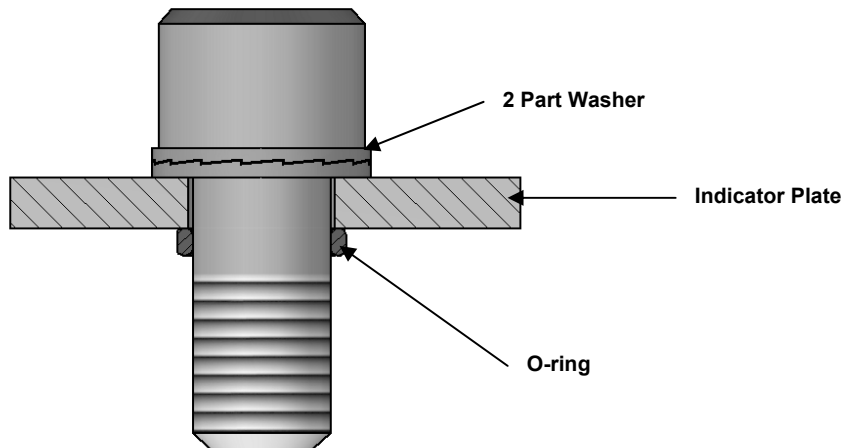
Fig.1 shows the removal of the output sleeve from the gearbox. See Fig.2 for removing the output sleeve without damaging the sealing faces.

Before refitting the output sleeve after machining, check that the surfaces marked 'A' in Fig.2 are not damaged. Damaged surfaces can break the gearbox seals and cause water ingress or grease leakage. Applying a thin layer of grease to the faces marked 'A' will make refitting of the sleeve easier.

As detailed in Fig. 1 and Fig. 2, it is recommended that silicon sealant is used to seal the indicator/cover plate to the output sleeve by applying sealant to the face marked D. Taking care not to apply sealant to the o rings (2) or the sealing faces of the o rings.

Before re-assembly, clean and de-grease the top face of the output sleeve, underside of the indicator/cover plate, and the socket head cap screws. Make a note of the tightening torque required for the output sleeve screws on the label on the underside of the indicator plate. Insert the screws and washers into the holes in the indicator/cover plate.

It is essential to fit the two part washers the correct way round with the cam faces of the washers joining. Place the o rings over the screw threads and against the indicator plate.



Apply a thin coat of silicon sealant to the top face of the output sleeve. Place the indicator on the output sleeve, with the indicator pointer in the correct orientation if applicable. Engage each screw through the indicator and output sleeve into the tappings in the gear quadrant. Fasten the screws evenly. As the screws start to tighten, press down on the indicator plate to extrude any excess sealant. Wipe away the excess. Tighten each screw to the recommended torque previously noted.

! WARNING It is absolutely essential to assemble and torque tighten the screws immediately after the sealant is applied to the indicator/cover plate and screws. Any delay will allow the sealant to start to cure. This will result in a flexible joint being formed between the output sleeve and indicator/cover plate. This joint would relax over time, allowing the screws to loosen.

6.2 Mounting to the valve

! WARNING - Ensure the valve is fully supported and capable of accepting increased weight and change of centre of gravity resulting from the addition of the gearbox combination.

If the gearbox has been supplied with a handwheel, it is recommended that this be fitted to the gearbox before mounting onto the valve. This will make it easier to rotate the gearing to pick up on the valve stem, either key, flats or square.

- 1) Ensure gearbox output is in the same relative position as the valve shaft (open or closed). Gearbox output position can be moved by rotating the input shaft or turning the actuator handwheel.

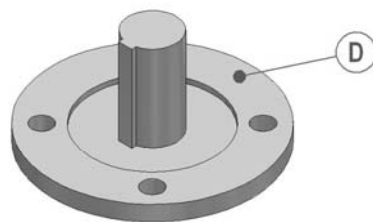


Fig. 3. Valve Mounting Flange

Important Note for Fig. 3:

D: It is recommended that flanges be sealed on assembly with silicon sealant. The face marked 'D' on Fig 3 shows where sealant can be applied to the valve mounting flange.

- 2) Align gearbox baseplate flange square and parallel to valve flange. As shown in Fig. 3, It is recommended that flanges be sealed on assembly with silicon sealant. Grease the output sleeve and the valve shaft.
- 3) Engage gearbox output sleeve on to valve shaft ensuring valve shaft keyway, square etc is in alignment (if necessary rotate output sleeve– refer to 1)
- 4) It is essential that the gearbox baseplate is flush with the valve bonnet flange before the mounting screws are tightened. Mounting screws or studs/nuts must be high tensile steel (grade 8.8 or higher). Firmly tighten down fixings onto the valve flange to the torque required. See Table B on page 9.

6.3 Setting the gearbox stops to suit the valve (IW and MOW Only)

This procedure should be carried out by the valvemaker/supplier and should be done when the valve opening and closing operations can be visibly checked. Once installed within the pipe the stops should not be altered without the authorisation of the valvemaker/supplier.

The gearbox stops are factory set but require adjusting for optimum valve performance.

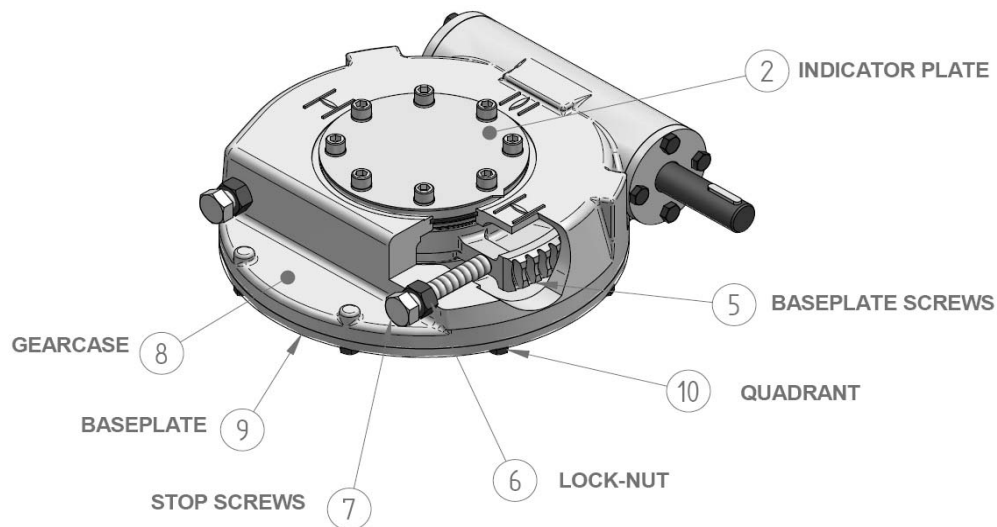


Fig. 4 Setting stop bolts

If an actuator is to be used to operate the gearbox then the actuator limit and torque switch settings should be set up according to the actuator manufacturer's recommendations. The gearbox open and closed stop screws should then be set. See Fig. 4. Close the valve, using the actuator where applicable. Use the indicator plate (2) pointer as an indication of position. Loosen the lock nuts (6) and wind the gearbox closed position stop screw (7) into the gearbox quadrant (5). Back the screw off one turn, then tighten the lock-nut (6) to secure the stop screw. Open the valve with the actuator, and then repeat the process with the open position stop screw.

Note – movement between baseplate (9) and gearcase (8) can occur when operating at near rated torques. It is recommended that regular maintenance occurs to verify baseplate screws (10) are correctly torqued.

6.4 Worm combination maintenance

Under normal operating conditions, no maintenance is required for the gearbox. Should the valve be taken out of service for overhaul, the gearbox baseplate may be removed and the lubricant changed using one of the following greases. The baseplate must be sealed using silicone sealant on re-assembly, unless fitted with o-rings. All o rings should be renewed.

IW RANGE

Manufacturer

Fuchs

Name

Renolit CL-X2

Temperature Range

-60°C to +120°C

MOW RANGE

Manufacturer

Fuchs

Name

Renolit LST 0

Temperature Range

-20°C to +120°C

MTW RANGE

Manufacturer

Fuchs

Name

Renolit EPLITH 00

Temperature Range

-10°C to +120°C

An equivalent extreme pressure lubricant may be used.

For extreme temperature applications, please consult Rotork Gears

7. INSTALLATION FOR MULTI-TURN IB & IS RANGE COMBINATIONS

7.1 Output sleeve removal, machining and refitting

IB and IS range of gearboxes have a removable output sleeve. Unless specifically requested at the ordering stage, the output sleeve will be supplied blank and must be machined to suit the valve stem/shaft.

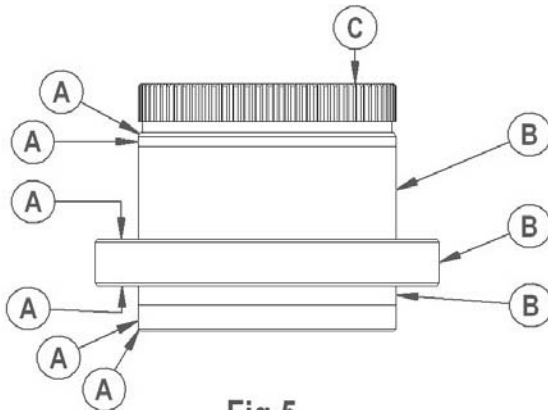


Fig.5

Important Notes for Fig. 5:

- A: The surfaces marked 'A' are sealing or bearing faces and must not be damaged.
- B: The surface marked 'B' can be used for chucking the output sleeve for machining.
- C: To remove the output sleeve from the gearbox, a force may have to be applied to the face marked 'C' of the output sleeve.

Before refitting the output sleeve after machining, check that the surfaces marked 'A' in Fig. 5 are not damaged. Damaged surfaces can break the gearbox seals or bearings and cause water ingress or grease leakage.

Applying a thin layer of grease to the faces marked 'A' will make refitting of the sleeve easier.

See Fig. 6: Note that the output sleeve arrangement is identical for IS and IB gearboxes. The sleeve (10) can be easily removed from the gearbox by first removing the loose piece spigot ring (11) from the baseplate (12). A slight force may have to be applied to the face marked 'C' to assist in removing the sleeve.

! WARNING: It is imperative that the thrust bearings in the output are fitted correctly, along with the output sleeve and the spigot ring. That is: the needle thrust bearings MUST have a thrust washer (8) at each side of the needle race (9). A bearing / washer assembly MUST be fitted at each side of the output sleeve thrust shoulder. All thrust elements and bearing cavities must be packed with grease of the correct specification.

The output sleeves are splined and may have to be rotated slightly to engage with the mating spline in the output gear.

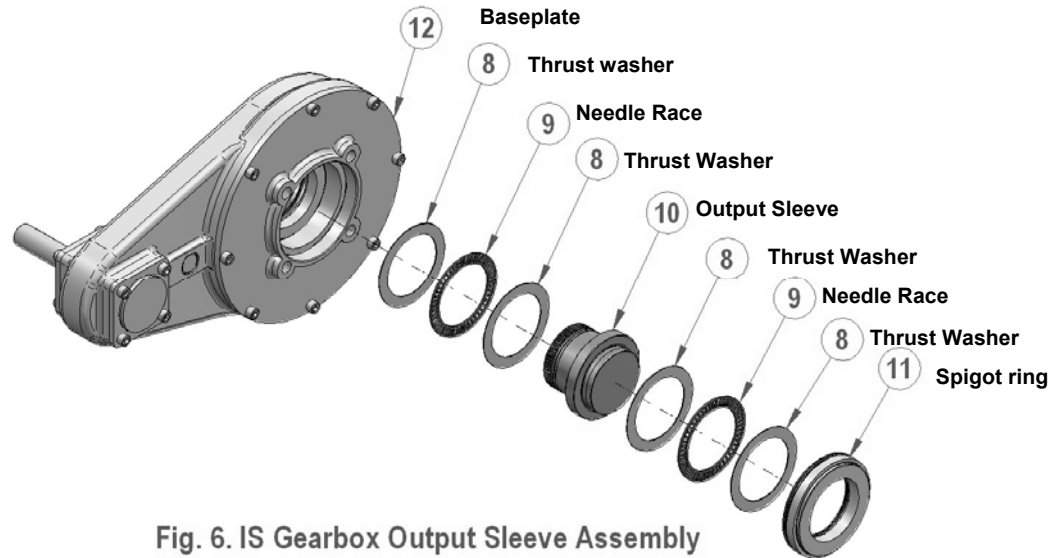


Fig. 6. IS Gearbox Output Sleeve Assembly

7.2 Mounting to the valve

! WARNING - Ensure the valve is fully supported and capable of accepting increased weight and change of centre of gravity resulting from the addition of the actuator-gearbox combination. The recommended maximum unsupported length for cover tubes is shown in table A.

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

! WARNING: Threaded stems should be thoroughly greased before fitting the output sleeve.

Gearboxes IB2 to IB7 and IS2 to IS6

- 1) Ensure the machined output sleeve assembly is correctly assembled into the gearbox – refer to Fig 6.
- 2) Align combination gearbox baseplate flange square and parallel to valve flange. It is recommended that flanges be sealed on assembly with silicon sealant.
- 3) Line up the machined output sleeve to the valve shaft. For non-rising stem valves (keyed shaft etc) engage fully (if necessary rotate output sleeve to align keyways). Lower the gearbox onto the valve flange, align mounting holes and secure using screws or studs with a minimum tensile strength of 800 N/mm². Firmly tighten down fixings onto the valve flange to the torque required. See Table B on page 9.
- 4) For rising stem valves (threaded stem) rotate handwheel in the direction required to screw the output sleeve onto the threaded valve stem (anticlockwise for a left hand stem thread). Continue to rotate the actuator handwheel to ensure combination gearbox assembly is fully screwed down on to the valve flange and the valve is partially open. Align mounting base holes and secure using screws or studs with a minimum tensile strength of 800 N/mm². Firmly tighten down fixings onto the valve flange to the torque required. See Table B on page 9.

- 5) For rising stem valves, a cover tube to protect the stem must be fitted. ! **WARNING: Do not pack the cover tube with grease as this can lead to pressure build up in the cover.** Screw or bolt the tube into the gearbox with a suitable sealant to prevent water ingress.
- 6) Cover tubes are extensions to the gearcasing and damage to the cover tubes can cause damage to the gearcase. It is essential that cover tubes are protected or supported to avoid side loads due to the environment or the application. See Table A below.

Gearboxes IB8 to IB14 and IS7 to IS20.

It is recommended that the machined output sleeve assembly is assembled on the valve stem/shaft first and then the actuator-gearbox combination lowered to locate on the output sleeve assembly. See Fig. 7 and 8 for assembly details

- 1) Fit the machined output sleeve (10), thrust bearings (8 & 9) and baseplate spigot ring (11) on the valve shaft as shown in the Fig.7 below. Bearings should be greased with the appropriate grease. Grease the output sleeve and valve stem/shaft. Note that the spigot ring has an internal and external seal that should also be greased.

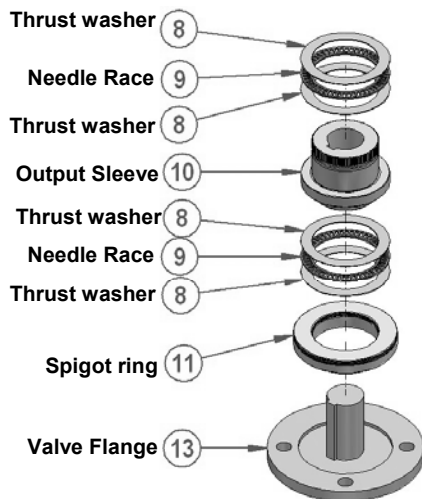


Fig. 7 Valve Stem Assembly

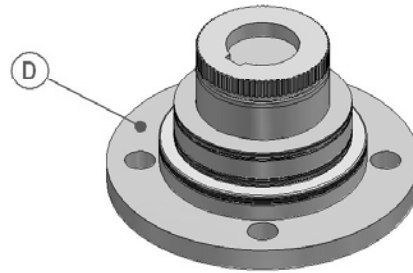


Fig 8. Valve Stem Assembled

- 2) It is recommended that flanges be sealed on assembly with silicon sealant. The face marked 'D' on Fig 8 shows where sealant can be applied
Lower the gearbox onto the assembled output sleeve assembly, taking care that the splines do not get damaged.
- 3) For valves with keyed shafts (non-rising as shown in Fig. 7 and 8), align base mounting holes and secure using screws or studs with a minimum tensile strength of 800 N/mm². For valves with screwed stems (rising stem), rotate the handwheel to ensure gearbox assembly is fully screwed down on to the valve flange. Continue to turn to partially open the valve. Align mounting base holes and secure using screws or studs with a minimum tensile strength of 800 N/mm². Firmly tighten down fixings onto the valve flange to the torque required. See Table B on page 9.
- 4) For rising stem valves, a cover tube to protect the stem must be fitted. ! **WARNING: Do not pack the cover tube with grease as this can lead to pressure build up in the cover.** Screw or bolt the tube into the gearbox with a suitable sealant to prevent water ingress.

- 5) Cover tubes are extensions to the gearcasing and damage to the cover tubes can cause damage to the gearcase. It is essential that cover tubes are protected or supported to avoid side loads due to the environment or the application. See Table A below.

Gearbox	Maximum unsupported tube length
IB2 to IB5, IS2 to IS5	2.0m (6.6ft)
IB6 to IB7, IS6 to IS7	2.8m (9.2ft)
IB8 to IB9, IS8 to IS9	3.0m (9.8ft)
IB10 to IB4, IS10 to IS20	5.0m (16.4ft)

Table A

MAINTENANCE INSTRUCTIONS FOR IB and IS GEAR OPERATORS

MAINTENANCE

All gear cavities are lubricated for life with Fuchs Renolit CL-X2 grease. 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 changed using the following recommended lubricant. The baseplate must be sealed using silicone sealant on re-assembly, unless fitted with an O ring. All O rings should be renewed.

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

Manufacturer Fuchs	Name Renolit CL-X2	Temperature Range -60°C to +120°C
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An equivalent extreme pressure lubricant may be used.
For extreme temperature applications, please consult the factory.

8. REFERENCE

Table B. Recommended tightening torques for mounting the gearbox to the valve:

Gearbox to valve fixing must conform to Material Specification ISO Class 8.8, yield strength 628N/mm² to use Table B below.

Imperial Size (Hex)	Torque		Metric Size (Hex)	Torque	
	Nm	lbs/ft		Nm	lbs/ft
3/8"	34	25	M5	5	4
7/16"	55	40	M6	9	6
1/2"	83	61	M8	21	15
9/16"	120	89	M10	41	30
5/8"	166	122	M12	71	53
3/4"	291	215	M16	177	131
7/8"	469	346	M20	346	255
1"	702	518	M24	598	441
1 1/4"	1403	1035	M30	1189	877
1 1/2"	2441	1800	M36	2079	1533

TABLE B.