

Gearbox Installation Manual

Rotork Gears HOB/MPR & HOS/MPR ranges

(Electronic copy available on www.rotork.com)

- ! 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, operate, adjust and inspect Rotork gearboxes. Only persons competent by virtue of their training or experience should install, maintain and repair Rotork gearboxes.**
- ! 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.

2. Health and safety

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: The gearbox enclosure materials may include; Cast Iron, Ductile Iron, Carbon Steel or Stainless Steel.

3. Storage

If the gearbox cannot be installed immediately, store it in a clean and dry place until installation can take place. The recommended storage temperature range is 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 gearbox combination to carry out a risk assessment to ensure safe working practices are used. Refer to Section 5.

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

! The gearboxes must be fully supported until full valve 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 gearbox and 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.

! We recommend fitting a bolt and washer system onto the baseplate of HOB/MPR and HOS/MPR gearboxes before moving them, as demonstrated in Figure 3 and Figure 4.

6. Installation & Maintenance for Multi-Turn HOB/MPR & HOS/MPR Combinations

6.1. Output Sleeve Removal, Machining and Re-Fitting

HOB/MPR and HOS/MPR 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. Before re-fitting the machined output sleeve, check that the surfaces marked 'A' in Figure 1 and Figure 2 are not damaged.

Damaged surfaces can break the gearbox seals or bearings and cause water ingress or grease leakage.

For all HOB/MPR and HOS/MPR gearboxes apart from HOB3, see Figure 1:

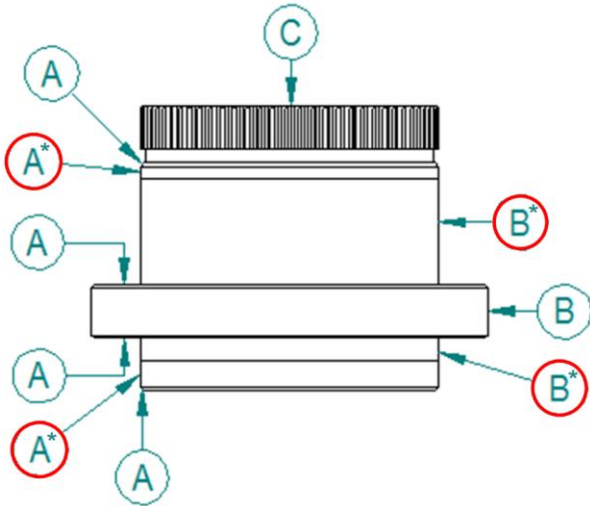


Figure 1 - Splined Output Sleeve, Important Surfaces

Important Notes:

- 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.

For the HOB3 gearbox, see Figure 2:

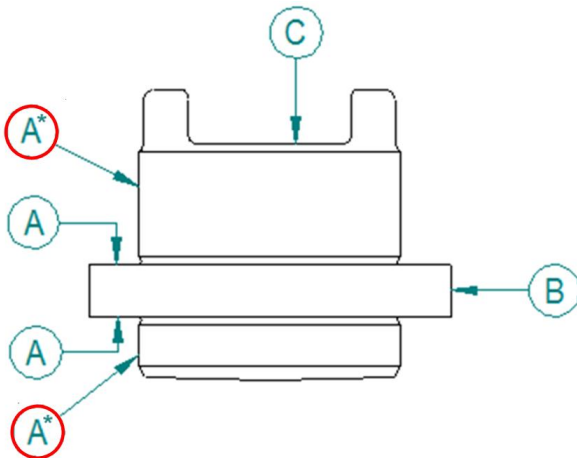


Figure 2 - Dog Drive Output Sleeve, Important Surfaces

Important Notes:

- 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.

An anti-friction compound containing molybdenum disulphide, such as MI-Setral-9M should be applied to the faces marked with "*" and highlighted in red in Figure 1 and Figure 2, before inserting the output sleeve back into the gearbox. For clarification on the suitability of an anti-friction compound, please contact Rotork Gears.

With reference to Figure 3 below, note that the output sleeve arrangement is identical for HOB/MPR and HOS/MPR gearboxes. The output sleeve (14) can be easily removed from the gearbox by first removing the spigot ring (15) from the baseplate (16). A small force may have to be applied to the face marked 'C' in Figure 1 and Figure 2 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 (12) at each side of the needle race (13). 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.

! WARNING: Bearings, Output sleeve and Valve Stem/shaft should be thoroughly greased with appropriate grease before fitting anytime they are fitted into the gearbox/valve. Note the spigot ring has an internal and external seal that should also be greased.

All output sleeves, with the exception of the HOB3, are splined and may have to be rotated slightly to engage with the mating spline in the output gear. The HOB3 has a dog drive which needs to be aligned to the mating sections in the output gear.

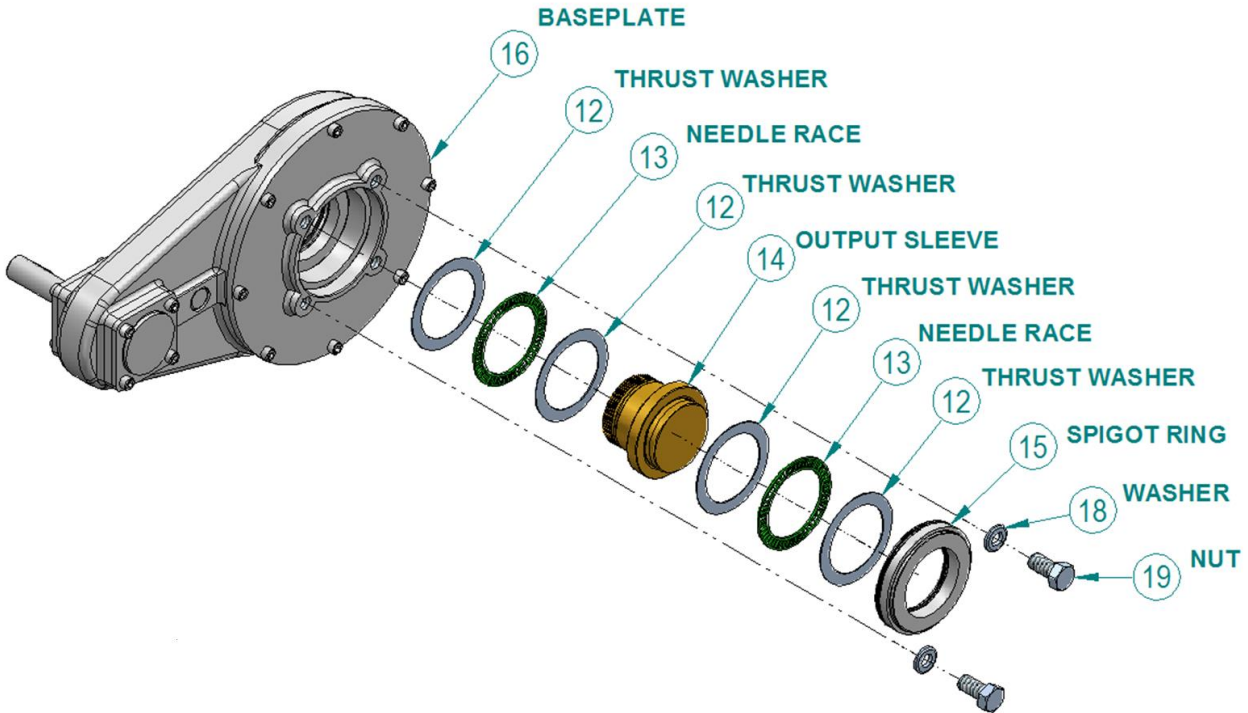


Figure 3 – HOB/MPR / HOS/MPR Output Sleeve Assembly

6.2. Mounting to the valve

! WARNING: Ensure the valve is fully supported and capable of accepting increased weight and a change of centre of gravity resulting from the addition of the gearbox combination. The recommended maximum unsupported length for cover tubes is shown in Table 1.

! WARNING: Bearings, Output sleeve and Valve Stem/shaft should be thoroughly greased with appropriate grease before fitting into the gearbox/valve. Note the spigot ring has an internal and external seal that should also be greased

! WARNING – We recommend fitting a nut (19) and washer (18) fixture into the base of the gearbox as demonstrated in Figure 3 and Figure 4. Note that the washers must overlap the spigot ring (15). This will stop the output sleeve assembly from becoming detached from the main body. The bolts and washers are not supplied by Rotork Gears.

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.

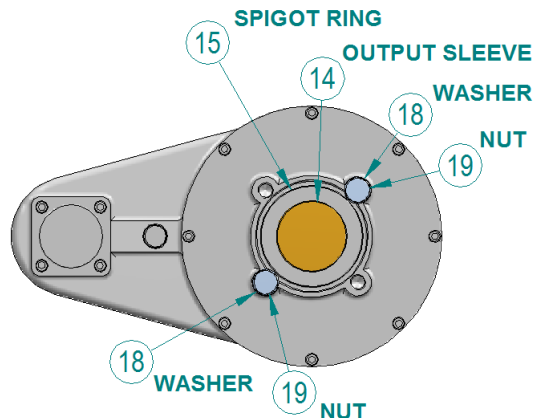


Figure 4 - Securing Spigot Example

! WARNING: Threaded stems should be thoroughly lubricated with grease before fitting the output sleeve.

6.2.1. All Gearboxes

- Ensure that the gearbox baseplate is parallel to the valve flange when lowering. This will avoid jamming.
- It is recommended that a silicon sealant is used between the gearbox baseplate and the valve flange. 'D' in Figure 5 highlights where this sealant should be applied.

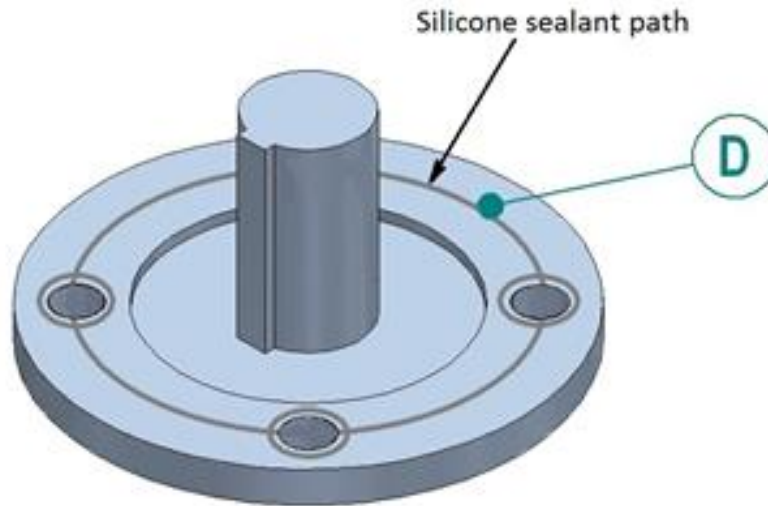


Figure 5 - Sealing of Valve Mounting Flange

- It is recommended that the machined output sleeve assembly is assembled onto the valve stem first and then the gearbox lowered onto the output sleeve assembly. See Figure 6 and Figure 7 for assembly details.
- Fit the machined output sleeve (14), thrust bearings (12 & 13) and baseplate spigot ring (15) on the valve shaft as shown in the Figure 6. Bearings should be lubricated with the appropriate grease. Grease the output sleeve and valve stem. Note that the spigot ring has an internal and external seal that should also be greased.

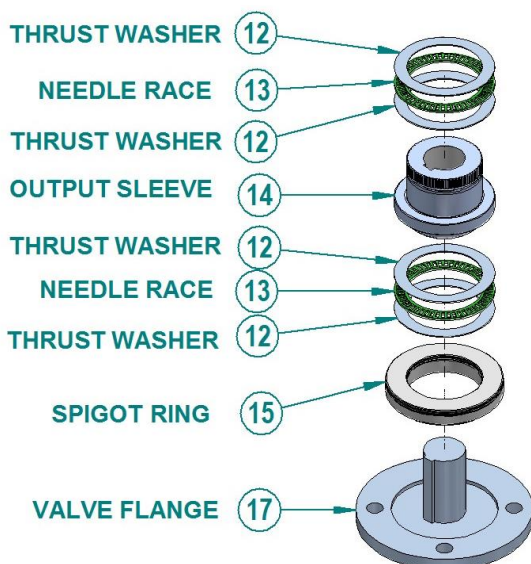


Figure 6 - Valve Stem Assembly

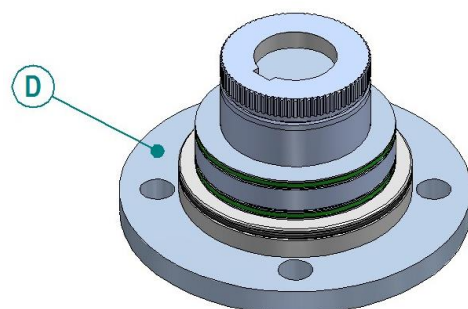


Figure 7 - Valve Stem (Assembled)

- For rising stem valves, a cover tube must be fitted to protect the valve stem. **! WARNING: Do not pack the cover tube with grease as this can lead to a pressure build up in the cover tube.** Screw or bolt the cover tube into the gearbox and seal with a suitable sealant to prevent water ingress.

- Cover tubes are extensions to the gearcase and thus, damage to the cover tube can cause damage to the gearcase. It is essential that the cover tubes are protected or supported to avoid side loads as a result of the environment or the application. See Table 1:

Gearbox	Maximum Unsupported Tube Length
HOB3 to HOB/MPR5, HOS/MPR4 to HOS/MPR5	2.0m (6.6ft)
HOB/MPR6 to HOB/MPR7, HOS/MPR6 to HOS/MPR7	2.8m (9.2ft)
HOB/MPR8 to HOB/MPR9, HOS/MPR8 to HOS/MPR9	3.0m (9.8ft)
HOB/MPR10 to HOB/MPR14, HOS/MPR10 to HOS/MPR20	5.0m (16.4ft)

Table 1 - Maximum Unsupported Tube Lengths

6.2.2. Gearboxes HOB/MPR14, HOS/MPR14 and HOS/MPR16

- Instead of bullet points 3 and 4 in Section 6.2.1, it is recommended that the cylindrical roller bearings and machined output sleeve are assembled onto the valve stem first and then the gearbox lowered to locate on the output sleeve assembly. See Figure 8 for assembly details:

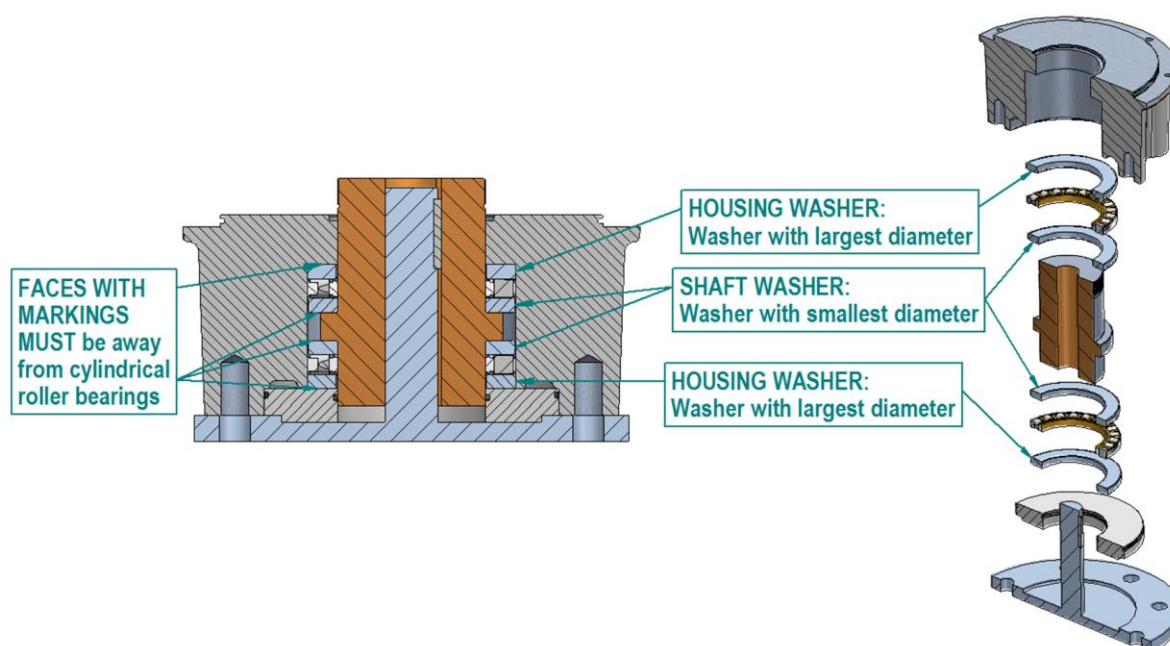


Figure 8 - Valve Stem Assembly with Cylindrical Roller Bearings

- Fit in the following order:
 - Spigot Ring,
 - Housing Washer (Largest Outside Diameter),
 - Bearing
 - Shaft Washer (Smallest Outside Diameter),
 - Output Sleeve,
 - Shaft Washer (Smallest Outside Diameter),
 - Bearing
 - Housing washer (Largest Outside Diameter)
- The washer faces that are either chamfered or have markings MUST FACE AWAY from the bearings to decrease wear on the bearing. Bearings should be lubricated with the appropriate grease. Grease the output sleeve and valve stem. Note that the spigot ring has an internal and external seal that should also be greased.

6.3. Maintenance Instructions for HOB/MPR & HOS/MPR gear operators

For standard duties, all gear cavities are lubricated for life with Fuchs Renolit CL-X2 grease. Under normal operating conditions, no maintenance is required for the gearbox. However, 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.

An anti-friction compound containing molybdenum disulphide, such as MI-Setral-9M should be applied to the faces marked with '*' and highlighted in red in Figure 1 and Figure 2, before inserting the output sleeve back into the gearbox. For clarification on the suitability of an anti-friction compound, please contact Rotork Gears.

Note: All thrust elements and bearing cavities must be cleaned, re-greased and re-fitted in the correct order. The recommended lubricant is shown in Table 2.

Gearbox	Manufacturer	Name	Temperature Range
HOB/MPR and HOS/MPR	Fuchs	Renolit CL-X2	-60°C to +120°C

Table 2 - Recommended Lubrication for Bevel and Spur Gearboxes

An equivalent extreme pressure lubricant may be used. For extreme temperature applications, please consult Rotork.

7. Paint Repair procedure

If paint repair is required, the following procedure should be followed:

- Clean surface using solvent if necessary.
- Rinse surface with clean fresh water to remove any foreign matter and traces of solvent.
- Abrade area using wet and dry sandpaper, or power sander, feather edges of sound intact paint around damaged area by 2.5 cm
- Apply paint system as per originally applied to unit ensuring that dry film thickness (dft) limits are met and time is allowed for each coat to cure. All as per the paint manufacturer's data sheets.

Ambient Conditions - No cleaning or coating application shall be undertaken if:

- The relative humidity is more than 85%
- The metal temperature is less than 3°C above the dew point.
- The ambient conditions are outside those stated in the paint manufacturer's data sheet for each coating.
- Coatings shall only be applied or cured at ambient and steel temperatures above 10°C or otherwise recommended by paint supplier.

8. Reference

Table 3 shows 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 3 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 3 - Torque Tightening Figures

9. Handwheel Types

Handwheel Type - Weight Kgs (lbs)					
Size in mm	CD (Cast)	PS (Pressed Steel)	SG (Steel - Welded)	S (Stainless Steel)	F/FS (Steel - Welded)
50	0.11 (0.24)	-	-	-	-
75	0.21 (0.46)	-	-	-	-
100	0.32 (0.71)	0.15 (0.33)	-	-	-
125	0.54 (1.19)	0.2 (0.44)	-	-	-
150	-	-	1 (2.20)	0.4 (0.88)	-
160	-	0.35 (0.77)	-	-	-
200	1 (2.20)	0.75 (1.65)	1.35 (2.98)	1 (2.20)	1 (2.20)
250	-	1.5 (3.31)	1.4 (3.09)	-	-
300	-	-	1.8 (3.97)	-	1.5 (3.31)
315	-	2 (4.41)	-	-	-
350	-	-	2.3 (5.07)	1.5 (3.31)	-
400	-	3.5 (7.72)	2.8 (6.17)	-	2.2 (4.85)
450	-	-	3 (6.61)	-	-
500	-	-	3.5 (7.72)	-	3 (6.61)
600	-	-	4.5 (9.92)	-	3.2 (7.05)
700	-	-	5 (11.02)	-	5.5 (12.13)
800	-	-	5.5 (12.13)	-	6.6 (14.55)
900	-	-	6 (13.23)	-	7.2 (15.87)
1000	-	-	-	-	8.4 (18.52)
1100	-	-	-	-	9.4 (20.72)
1200	-	-	-	-	10.27 (22.64)

Table 4 - Handwheel Weights by Type