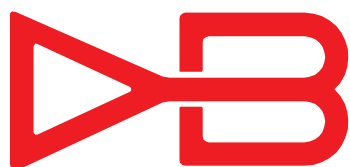


INSTALLATION & MAINTENANCE

SERIES K



DAVID BROWN

R A D I C O N

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IMPORTANT

Product Safety Information

General - The following information is important in ensuring safety. It **must** be brought to the attention of personnel involved in the selection of David Brown Radicon Limited power transmission equipment, those responsible for the design of the machinery in which it is to be incorporated and those involved in its installation, use and maintenance.

David Brown power transmission equipment will operate safely provided it is selected, installed, used and maintained properly. As with any power transmission equipment **proper precautions must** be taken as indicated in the following paragraphs, to ensure safety.

Potential Hazards - these are **not** necessarily listed in any order of severity as the degree of danger varies in individual circumstances. It is important therefore that the list is studied in its entirety:-

- 1) Fire/Explosion
 - (a) Oil mists and vapour are generated within gear units. It is therefore dangerous to use naked lights in the proximity of gearbox openings, due to the risk of fire or explosion.
 - (b) In the event of fire or serious overheating (over 300 °C), certain materials (rubber, plastics, etc.) may decompose and produce fumes. Care should be taken to avoid exposure to the fumes, and the remains of burned or overheated plastic/rubber materials should be handled with rubber gloves.
- 2) Guards - Rotating shafts and couplings must be guarded to eliminate the possibility of physical contact or entanglement of clothing. It should be of rigid construction and firmly secured.
- 3) Noise - High speed gearboxes and gearbox driven machinery may produce noise levels which are damaging to the hearing with prolonged exposure. Ear defenders should be provided for personnel in these circumstances. Reference should be made to the Department of Employment Code of Practice for reducing exposure of employed persons to noise.
- 4) Lifting - Where provided (on larger units) only the lifting points or eyebolts must be used for lifting operations (see maintenance manual or general arrangement drawing for lifting point positions). Failure to use the lifting points provided may result in personal injury and/or damage to the product or surrounding equipment. Keep clear of raised equipment.
- 5) Lubricants and Lubrication
 - (a) Prolonged contact with lubricants can be detrimental to the skin. The manufacturer's instruction must be followed when handling lubricants.
 - (b) The lubrication status of the equipment must be checked before commissioning. Read and carry out all instructions on the lubricant plate and in the installation and maintenance literature. Heed all warning tags. Failure to do so could result in mechanical damage and in extreme cases risk of injury to personnel.
- 6) Electrical Equipment - Observe hazard warnings on electrical equipment and isolate power before working on the gearbox or associated equipment, in order to prevent the machinery being started.
- 7) Installation, Maintenance and Storage
 - (a) In the event that equipment is to be held in storage, for a period exceeding 6 months, prior to installation or commissioning, David Brown Radicon Limited must be consulted regarding special preservation requirements. Unless otherwise agreed, equipment must be stored in a building protected from extremes of temperature and humidity to prevent deterioration.
The rotating components (gears and shafts) must be turned a few revolutions once a month (to prevent bearings brinelling).
 - (b) External gearbox components may be supplied with preservative materials applied, in the form of a "waxed" tape overwrap or wax film preservative. Gloves should be worn when removing these materials. The former can be removed manually, the latter using white spirit as a solvent.
Preservatives applied to the internal parts of the gear units do not require removal prior to operation.
 - (c) Installation must be performed in accordance with the manufacturer's instructions and be undertaken by suitably qualified personnel.
 - (d) Before working on a gearbox or associated equipment, ensure that the load has been removed from the system to eliminate the possibility of any movement of the machinery and isolate power supply. Where necessary, provide mechanical means to ensure the machinery cannot move or rotate. Ensure removal of such devices after work is complete.
 - (e) Ensure the proper maintenance of gearboxes in operation. Use only the correct tools and David Brown Radicon Limited approved spare parts for repair and maintenance. Consult the Maintenance Manual before dismantling or performing maintenance work.
- 8) Hot Surfaces and Lubricants
 - (a) During operation, gear units may become sufficiently hot to cause skin burns. Care must be taken to avoid accidental contact.
 - (b) After extended running the lubricant in gear units and lubrication systems may reach temperatures sufficient to cause burns. Allow equipment to cool before servicing or performing adjustments.
- 9) Selection and Design
 - (a) Where gear units provide a holdback facility, ensure that back-up systems are provided if failure of the holdback device would endanger personnel or result in damage.
 - (b) The driving and driven equipment must be correctly selected to ensure that the complete machinery installation will perform satisfactorily, avoiding system critical speeds, system torsional vibration, etc.
 - (c) The equipment must not be operated in an environment or at speeds, powers, torques or with external loads beyond those for which it was designed.
 - (d) As improvements in design are being made continually the contents of this catalogue are not to be regarded as binding in detail, and drawings and capacities are subject to alterations without notice.

The above guidance is based on the current state of knowledge and our best assessment of the potential hazards in the operation of the gear units.

Any further information or clarification required may be obtained by telephoning or writing to:


SECTION	DESCRIPTION	PAGE No
1	Unit Identification _____	1
2	General Information _____	2
3	Weather Protection _____	2
4	Type of Units Supplied _____	2
5	Installation	
5.1	Fitting of Components to Shafts _____	2
5.2	Installation of Unit to Equipment _____	3
5.3	Fixing to Customers Equipment _____	3
5.4	Guards _____	3
5.5	Connecting Electric Motor _____	3
5.6	Oil Fill _____	4
5.7	Ventilator _____	4
5.8	Shaft Mounted Units _____	4
6	Maintenance	
6.1	Periodic Inspection _____	4
6.2	Lubricant Changes _____	4
6.3	Lubricant Quantity _____	5
6.4	Approved Lubricants _____	5
6.5	Approved Greases _____	5
6.6	Cleaning _____	5
7	Operation	
7.1	Noise _____	5
7.2	General Safety _____	5
APPENDIX		
1	Assembly of Motor to the Gearhead _____	6
2	Lubricant Quantity _____	7
	Approved Lubricants _____	8
	Mounting Positions _____	9
3	Three Phase Induction Motor Installation _____	10
4	Brake Installation _____	11 - 13
5	Approved Bearing Greases _____	14
6	Shaft Alignment _____	15 - 16
7	Assembly onto Shaft - Customer Shaft Detail _____	17
	Disassembly Method from Shaft _____	17
	Torque Bracket Fixing _____	18
	Alternative Shaft Fixing Methods _____	19
8	TA Bushing Installation _____	20

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1 UNIT IDENTIFICATION

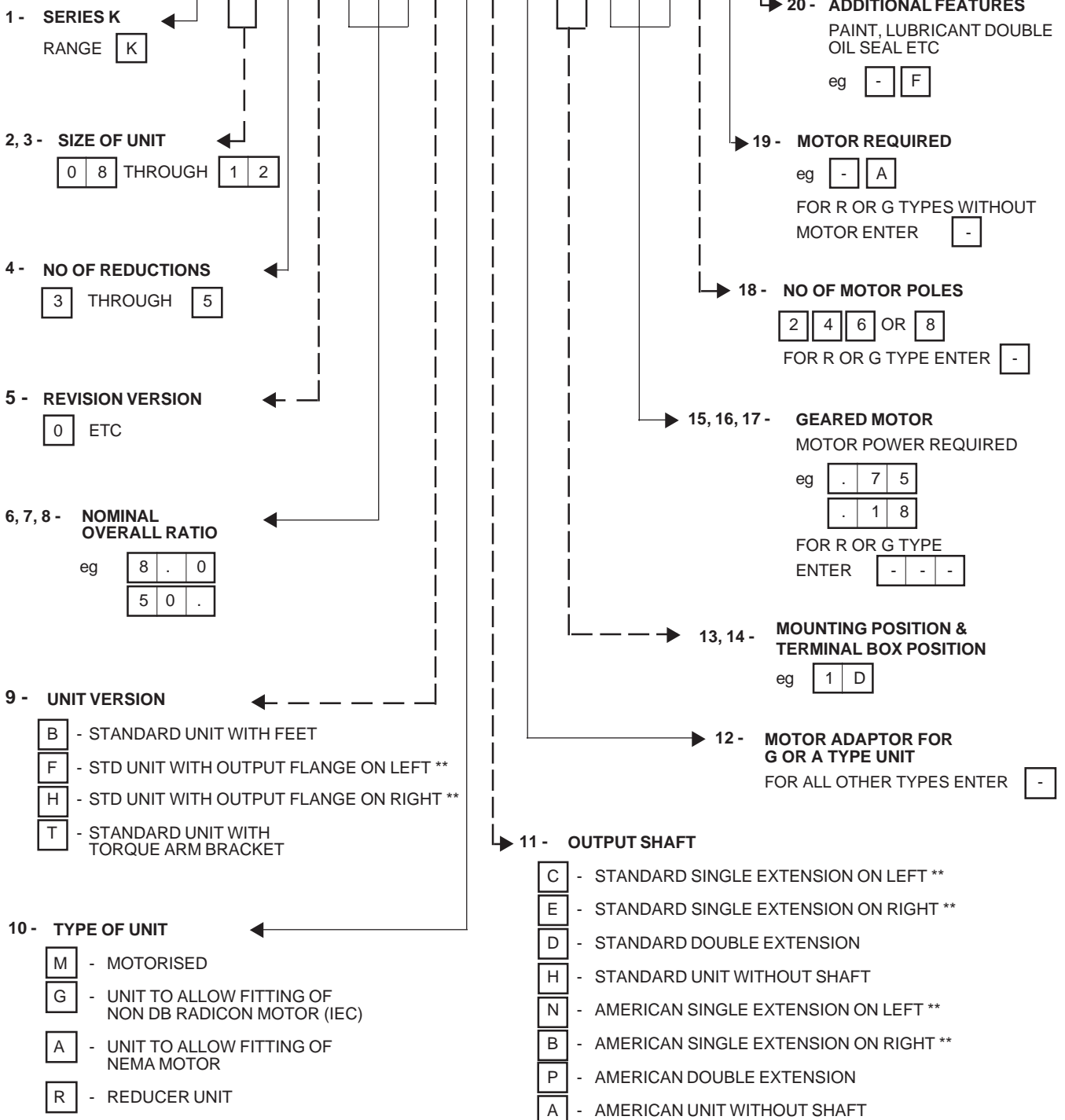
When requesting further information, or service support quote the following information from the nameplate:

- Unit Type
- Order Number

			
UNIT TYPE	<input type="text"/>	OUTPUT RPM	<input type="text"/>
ORDER No	<input type="text"/>	ASSEMBLY POSITION	<input type="text"/> *
INPUT KW	<input type="text"/>	DB OIL GRADE	<input type="text"/> *
RATIO	<input type="text"/>		

* See Appendix 2

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
EXAMPLE	K	0	8	3	0	5	0	.	B	M	C	-	1	D	.	1	8	4	A	-



** LOOKING ON INPUTSHAFT MOUNTING POSITION 1

2 GENERAL INFORMATION

The following instructions will help you achieve a satisfactory installation of your David Brown Radicon Series K unit, ensuring the best possible conditions for a long and trouble free operation.

All units are tested and checked prior to despatch, a great deal of care is taken in packing and shipping arrangements to ensure that the unit arrives at the customer in the approved condition.

3 WEATHER PROTECTION OF UNIT

All Series K units are provided with protection against normal weather conditions. Where units are to operate in extreme conditions, or where they are to stand for long periods without running, eg during plant construction, we should be notified when ordering so that arrangements for adequate protection can be made.

4 TYPE OF UNIT SUPPLIED

Series K units may be supplied in a number of different ways, as either,

- a) a motorised unit ready for installation,
- b) a gear reducer ready for installation
- or c) a motor ready gear head for the customer to fit his own supply of motor (see Appendix 1 for fitting instructions).

5 INSTALLATION

5.1 FITTING OF COMPONENTS TO EITHER THE UNIT INPUT OR OUTPUT SHAFT

The input or output shaft extension diameter tolerance is to ISO tolerance k6 (for shaft diameter \leq 50mm) and m6 (for shaft diameter $>$ 50mm) and the fitted components should be to ISO tolerance M7 (for bore diameter \leq 50mm) and K7 (for bore diameter $>$ 50 mm).

- Clean shaft extensions.
- Items (such as gears, sprockets, couplings etc) should not be hammered onto these shafts since this would damage the shaft support bearings.
- The item should be pushed onto the shaft using a screw jack device fitted into the threaded hole provided in the end of the shaft.
- Items being fitted may be heated to 80/100°C to aid assembly further.

THREADED HOLE DETAILS

UNIT SIZE	INPUT SHAFT	OUTPUT SHAFT
K0830	M10 x 22 mm deep	M20 x 42 mm deep
K0930	M12 x 28 mm deep	
K1030	M16 x 36 mm deep	
K1230	M20 x 42 mm deep	M24 x 55 mm deep

9612

5.2 INSTALLATION OF UNIT TO EQUIPMENT

The following conditions must be satisfied prior to fitting the drive to the equipment:-

- **Fixing Structure Must be Rigid**

ie The design of the structure that the unit will be fitted to must be rigid enough to react to the start up and operating loads without deflecting.

- **Mounting Points are Flat and at the Same Level**

ie With the unit in the free state prior to bolting down there must be no gaps under any of the feet or flange face and the structure.

If there is, use metal packing pieces (shims) to fill the gaps.

- **Align Unit with Equipment**

Refer to Appendix 6.



NOTE: Failure to observe any of these disciplines could result in the gear case being twisted with resulting errors in alignment of the internal gearing which could in turn result in damage to, or failure of the gears

5.3 FIXING TO CUSTOMER EQUIPMENT

Fixing the Gear Head flange facing or feet to the customer equipment use set screws to ISO grade 8.8 minimum.

Torque tighten to:-

Set Screw Size	Tightening Torque
M8	25 Nm
M10	50 Nm
M12	85 Nm
M16	200 Nm
M20	350 Nm
M24	610 Nm
M30	1220 Nm
M36	2150 Nm

5.4 GUARDS

The customer must ensure that any exposed rotating shafts and couplings, guards must be fitted in accordance with the relevant 'Machinery Safety' codes of practice.

5.5 CONNECTING ELECTRIC MOTOR

- Connect electric motor to the mains supply (Refer to Appendix 3 for more detail).
- Check motor wiring for correct direction of rotation. This is very important when a holdback is fitted.
- Brake motor connection (Refer to Appendix 4 for more detail).

5.6 OIL FILL

The client will fill the gear unit with oil (Unless factory filled by request).

- Oil Type* - For list of recommended lubricants refer to Appendix 2, Tables 4 and 5.
- Approximate Order Quantity - Refer to Appendix 2, Table 2 or 3.
- How to Fill:
 - Refer to Appendix 2, mounting positions page. This indicates the filling point, level point and drain point relating to each mounting position.
 - Remove filler and level plugs.
 - Fill unit with oil until it starts to run out of the level hole.
 - Refit plugs.

* NOTE: Clients wishing to use food compatible or biodegradable lubricants should contact David Brown for further information.

5.7 VENTILATOR

A ventilator plug is supplied loose with each unit (contained in a cloth bag, and attached to the unit).

Remove the filler plug as indicated in Appendix 2, mounting positions page, and fit the ventilator plug.

5.8 SHAFT MOUNTED UNITS

- a) Clean shaft extensions and output line bore of the unit.
- b) Locate the unit in position onto the head shaft by the most convenient method shown in Appendix 7.
- c) Anchor the unit to a secure point on the structure by means of the torque arm (reference Appendix 7 for more detail).
- d) Action points 5.4 to 5.7 to finish commissioning the unit.

6 MAINTENANCE

6.1 PERIODIC INSPECTION

Check oil level weekly and if necessary top up with the recommended grade of lubricant.

6.2 OIL CHANGES

Regular oil changes are essential and the following factors should be used to determine the frequency at which these are carried out.

- a. Oil temperature - unit operating under load.
- b. Type of oil.
- c. Environment - humidity, dust, etc.
- d. Operating conditions - shock, loading, etc.

At elevated temperatures the effective life of the oil is very much reduced. This is most pronounced with oils containing fatty and E.P. additives. To prevent damage to the unit through lubricant breakdown the oil should be renewed as detailed in the following table:

UNIT OPERATING TEMPERATURE °C	RENEWAL PERIOD			
	MINERAL OIL		SYNTHETIC OIL	
75 OR LESS	17000 HOURS	OR	3 YEARS	26000 HOURS OR 3 YEARS
80	12000 HOURS	OR	3 YEARS	26000 HOURS OR 3 YEARS
85	8500 HOURS	OR	3 YEARS	21000 HOURS OR 3 YEARS
90	6000 HOURS	OR	2 YEARS	15000 HOURS OR 3 YEARS
95	4200 HOURS	OR	17 MONTHS	10500 HOURS OR 3 YEARS
100	3000 HOURS	OR	12 MONTHS	7500 HOURS OR 2 1/2 YEARS
105	2100 HOURS	OR	8 MONTHS	6200 HOURS OR 2 YEARS
110	1500 HOURS	OR	6 MONTHS	5200 HOURS OR 18 MONTHS
NB: INITIAL FILL OF OIL SHOULD BE CHANGED IN A NEW GEAR UNIT AFTER 1000 HOURS OPERATION OR ONE YEAR OR HALF THE ABOVE LIFE WHICHEVER IS THE SOONEST				

Note: Figures quoted are for oil temperatures when the unit has attained normal running temperature when operating under load. These figures are based on normal running but where conditions are particularly severe it may be necessary to change the oil more frequently. When changing lubricant, if same lubricant is not used then unit must be flushed out and filled only with one type of lubricant.

6.3 LUBRICANT QUANTITY

The quantity of lubricant required by size and mounting position is given in Tables 2 and 3, Appendix 2. A diagram showing mounting position designations is also included in Appendix 2.

6.4 APPROVED LUBRICANTS

Tables 4 and 5 Appendix 2 give the lubricants approved for use in the gear unit.

6.5 APPROVED GREASES

Appendix 5 gives the greases approved for use in the unit. This need only apply if greasing points are supplied on the unit (ie grease nipples).

6.6 CLEANING

With the drive stationary periodically clean any dirt or dust from the gear unit and the electric motor cooling fins and fan guard to aid cooling.

7 OPERATION

7.1 NOISE

The range of Series K product satisfies a noise (sound pressure level) of 85 dB(A) or less when measured at 1 metre from the unit surface.

Measurements taken in accordance with B.S.7676 Pt1 : 1993 (ISO 8579-1 : 1993).

7.2 GENERAL SAFETY

Potential hazards which can be encountered during installation, maintenance and operation of drives is covered in greater detail in the product safety page at the front of this booklet.

Advice is also given on sensible precautions which need to be taken to avoid injury or damage.

PLEASE READ !

Any further information or clarification required may be obtained by contacting:-

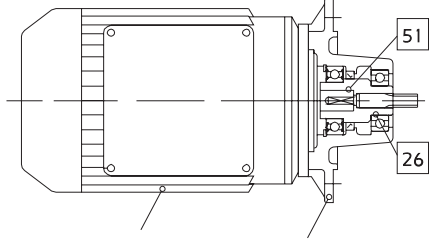
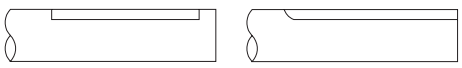
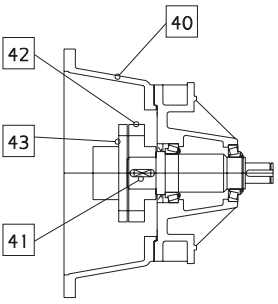
David Brown Radicon Ltd
Park Gear Works
Huddersfield
England HD4 5DD

Telephone: 01484 465610

ASSEMBLY OF MOTOR TO GEAR HEAD

If unit has been supplied as a gear head type to allow the fitting of a motor separately, assemble as follows depending on motor frame size:-

FITTING ELECTRIC MOTOR AND DRIVING KEY

Electric Motor Frame Size	Driving Key Where and How Fitted
<p>Sizes K08, 09, 10 & 12 IEC 80, 90, 100/112, 132, 160, 180 & 200 All NEMA</p>  <p>Electric Motor Motor Adaptor</p>	<ul style="list-style-type: none"> - Plastic sleeve/key (51) already fitted into plug-in shaft (26) of motor adaptor (retain the metal key already in the electric motor shaft, this will assemble into the sleeve keyway and drive through it). - Secure electric motor with setscrews provided to torque settings shown in table below.
<p>Size K08 IEC 71, 160 NEMA 254/256</p> <p>Sizes K09, 10 & 12 IEC 225</p>  <p>Figure 2 Figure 3</p>	<ul style="list-style-type: none"> - Remove and discard the metal key in the electric motor shaft keyway. - Fit the plastic key provided (51) into the electric motor shaft keyways. <p>Note: Plastic key / motor shaft keyway</p> <ol style="list-style-type: none"> 1) Closed ended full depth keyway (Fig 2); The plastic key length suites an open ended keyway, shorten key to fit, (same length as metal key removed). 2) Open ended keyway with run out (Fig 3); To prevent plastic key movement and damage during assembly, fix key in motor shaft keyway with instant adhesive (Loctite Prism 454, or Marston Hyloglue Gel, or equivalent). <ul style="list-style-type: none"> - Fit electric motor into the motor adaptor securing with setscrews provided to torque settings shown in table below.
<p>Size K12 IEC 250 & 280 NEMA 364/365 & 404/405</p> 	<ul style="list-style-type: none"> - Fit motor adaptor extension (40) to motor adaptor with setscrews provided. - Fit key (41) into input shaft keyway. - Fit driven half coupling (42) to input shaft extension. - Fit driving half coupling (43) to the electric motor shaft. - Attach electric motor to this assembly with the setscrews provided and torque settings shown below.

SET SCREW TORQUES:-

SET SCREW SIZES	RECOMMENDED TORQUE
M6	10 Nm
M8	18 Nm
M10	37 Nm
M12	64 Nm
M16	150 Nm

9702

LUBRICANT AND QUANTITY

The Series K range of gear units are despatched without oil. The David Brown Radicon oil grade is stamped on the nameplate and the oil level should be taken using the level plug, see page 9. These are determined from the gear unit ratio and the ambient temperature range, which if not given when ordering will be assumed to be 1450 rev/min and ambient temperature range 0 to 35°C. Oil grades and oil level should therefore be checked before installation.

To determine the David Brown oil grade refer to table 1, and then subsequently to table 4 or 5 which gives approved lubricants. To determine the oil capacity refer to the appropriate table 2 or 3. Oil capacities are only approximate and units should be filled until oil escapes from the level plug hole. Do not overfill as excess will cause overheating and leakage.

TABLE 1 OIL GRADES

GEAR UNIT DETAILS		AMBIENT TEMPERATURE RANGE *		
UNIT TYPE	RATIO RANGE	-5°C to 20°C (type E) -30°C to 20°C (type H)	0°C to 35°C	20°C to 50°C
TRIPLES	0 - 45	5E (5H)	6E (5H)	7E (6H)
	50 - 160	6E (5H)	7E (6H)	8E (7H)
QUINTUPLES	ALL	6E (5H)	7E (6H)	8E (7H)

* For input speeds below 500 rev/min and other ambient temperatures please refer to David Brown Radicon Application Engineers

TABLE 2 LUBRICANT QUANTITY (Litres) TRIPLE REDUCTION

Oil quantities are approximate, fill gearbox until oil escapes from level plug hole

TRIPLE REDUCTION					
Unit Size		K0830	K0930	K1030	K1230
DAVID BROWN MOUNTING POSITION	1	4.5	8.8	14.0	22.0
	2	9.3	17.5	28.6	41.0
	3	6.2	12.0	19.2	27.0
	4	9.1	18.0	27.5	46.0
	5	10.4	20.9	33.0	49.0
	6	9.1	16.3	25.6	35.9

TABLE 3 LUBRICANT QUANTITY (Litres) QUINTUPLE REDUCTION

Oil quantities are approximate, fill gearbox until oil escapes from level plug hole

QUINTUPLE REDUCTION									
Unit Size	K0850		K0950		K1050		K1250		
	* Primary M0620	Secondary K0830	* Primary M0620	Secondary K0930	* Primary M0720	Secondary K1030	* Primary M0820	Secondary K1230	
DAVID BROWN MOUNTING POSITION	1	1.7	4.5	1.7	8.8	3.3	14.0	2.6	22.0
	2	1.7	9.3	1.7	17.5	3.3	28.6	2.6	41.0
	3	1.7	6.2	1.7	12.0	3.3	19.2	2.6	27.0
	4	1.7	9.1	1.7	18.0	3.3	27.5	2.6	46.0
	5	3.1	10.4	3.1	20.9	6.3	33.0	9.5	49.0
	6	3.6	9.1	3.6	16.3	6.8	25.6	10.5	35.9

* NOTE: Primary units filled with David Brown Grade 6E lubricant suitable for all ambient temperatures between 0°C and 35°C

**TABLE 4 APPROVED LUBRICANTS
TYPE E - MINERAL OIL WITH EP PACKAGE**

LUBRICANT SUPPLIER	LUBRICANT RANGE NAME	DAVID BROWN GRADE No			
		5E	6E	7E	8E
Ampol Limited	Gearlube SP	SP220 (-1)	SP320 (-1)	SP460 (-1)	SP680 (-1)
Batoyle Freedom Group	Remus	220 (-2)	320 (-2)	460 (-2)	680 (-1)
Boxer Services Limited	Indus	220 (-10)	320 (-10)	460 (-10)	680 (-10)
BP Oil International Limited	Energol GR-XF	220 (-16)	320 (-13)	460 (-1)	680 (-1)
	Energol GR-XP	220 (-15)	320 (-10)	460 (-7)	680 (-4)
Caltex	Meropa	220 (-4)	320 (-4)	460 (-4)	680 (-1)
	RPM Borate EP Lubricant	220 (-7)	320 (-4)	460 (-7)	
Carl Bechem GmbH	Berugear GS BM	220 (-20)	320 (-13)	460 (-10)	
	Staroil G	220 (-13)	320 (-13)	460 (-10)	680 (-7)
Castrol International	Alpha Max	220 (-19)	320 (-13)	460 (-10)	
	Alpha SP	220 (-16)	320 (-16)	460 (-1)	680 (-1)
Chevron Lubricants	Gear Compound EP (USA version)	220 (-16)	320 (-13)	460 (-10)	680 (-7)
	Gear Compound EP (Eastern ver)	220 (-13)	320 (-13)	460 (-13)	680 (-10)
	Ultra Gear	220 (-10)	320 (-7)	460 (-7)	680 (-2)
Eko-Elda (Greece)	Gearlub	220 (-13)	320 (-10)	460 (-1)	
Engen Petroleum Limited	Gengear	220 (-13)	320 (-10)	460 (-1)	680 (-1)
Esso	Spartan EP	220 (-16)	320 (-13)	460 (-7)	680 (-4)
Esso/Exxon	Spartan EP	220 (-12)	320 (-12)	460 (-4)	680 (-4)
Fina	Giran	220 (-13)	320 (-10)	460 (-10)	680 (-7)
Fuchs Lubricants (UK) Plc	Powergear		P/Gear (-16)	M460 (-4)	H680 (-4)
	Renogear V	220EP (-13)	320EP (-4)	460EP (-4)	680EP (-4)
	Renogear WE	220 (-7)	320 (-4)	400 (-4)	
Fuchs Mineraloelwerke GmbH	Renolin CLPF Super	6 (-13)	8 (-10)	10 (-10)	12 (-10)
Klüber Lubrication	Klüberoil GEM1	220 (-5)	320 (-5)	460 (-5)	680 (0)
Kuwait Petroleum International	Q8 Goya	220 (-16)	320 (-13)	460 (-10)	680 (-4)
Lubrication Engineers Inc	Almasol Vari-Purpose Gear	607 (-18)	605 (-13)	608 (-10)	609 (-7)
Mobil Oil Company Limited	Mobil gear 600 Series	630 (-13)	632 (-13)	634 (-1)	636 (-1)
	Mobil gear XMP	220 (-19)	320 (-13)	460 (-7)	680 (-4)
Omega Manufacturing Division	Omega 690		85w/140 (-15)		
Optimol Ölwerke GmbH	Optigear BM	220 (-11)	320 (-10)	460 (-7)	680 (-4)
	Optigear	220 (-18)	320 (-9)	460 (-7)	680 (-10)
Pertamina (Indonesia)	Masri	220 (-4)	320 (-4)	460 (-4)	680 (-4)
Petro-Canada	Ultima EP	220 (-22)	320 (-16)	460 (-10)	680 (-4)
Petromin Lubricating Oil Co.	Gear Lube EP	EP220 (-1)	EP320 (0)	EP460 (0)	
Rocol	Sapphire Hi-Torque	220 (-13)	320 (-13)	460 (-13)	680 (-13)
Sasol Oil (Pty) Limited	Cobalt	220 (-4)	320 (-1)	460 (-4)	680 (+2)
	Hemat	220 (-10)	320 (-7)	460 (-4)	680 (+2)
Shell Oils	Omala	220 (-4)	320 (-4)	460 (-4)	680 (-1)
	Omala F	220 (-13)	320 (-10)	460 (-4)	680 (-4)
Texaco Limited	Meropa	220 (-16)	320 (-16)	460 (-10)	680 (-10)
Total	Carter EP	220 (-7)	320 (-7)	460 (-4)	
Tribol GmbH	Molub-Alloy Gear Oil	90 (-18)	690 (-16)	140 (-13)	190 (-10)
	Tribol 1100	220 (-20)	320 (-18)	460 (-16)	680 (-10)

Numbers in brackets indicates recommended minimum operating temperature°C

**TABLE 5 APPROVED LUBRICANTS
TYPE H - POLYALPHAOLEFIN BASE SYNTHETIC**

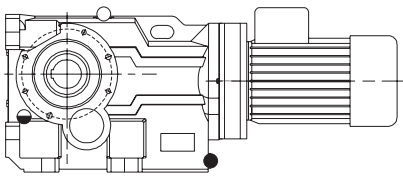
LUBRICANT SUPPLIER	LUBRICANT RANGE NAME	DAVID BROWN GRADE No		
		5H	6H	7H
Batoyle Freedom Group	Titan	220 (-31)	320 (-28)	
Boxer Services Limited	Silkgear	220 (-35)	320 (-35)	460 (-35)
BP Oil International Limited	Enersyn EPX		320 (-28)	
Caltex	Pinnacle EP	220 (-43)	320 (-43)	460 (-37)
Carl Bechem GmbH	Berusynth GP	220 (-38)	320 (-35)	460 (-32)
Castrol International	Alphasyn EP	220 (-37)	320 (-31)	460 (-31)
	Alphasyn T	220 (-31)	320 (-28)	460 (-28)
Chevron Lubricants	Tegra	220 (-46)	320 (-33)	460 (-31)
Esso/Exxon	Spartan Synthetic EP	220 (-46)	320 (-43)	460 (-40)
Fina	Giran P	220 (-30)	320 (-25)	460 (-19)
Fuchs Lubricants (UK) Plc	Renogear SG	220 (-32)	320 (-30)	
Fuchs Mineraloelwerke GmbH	Renolin Unisyn CLP	220 (-37)	320 (-34)	460 (-28)
Klüber Lubrication	Klübersynth GEM 4	220 (-35)	320 (-35)	460 (-30)
Kuwait Petroleum International	Q8 EL Greco	220 (-22)	320 (-19)	460 (-16)
Lubrication Engineers Inc	Synolec Gear Lubricant	9920 (-40)		
Mobil Oil Company Limited	Mobilgear SHC	220 (-40)	320 (-37)	460 (-32)
	Mobilgear SHC XMP	220 (-40)	320 (-33)	460 (-31)
Optimol Ölwerke GmbH	Optigear Synthetic A	220 (-31)	320 (-31)	
Petro-Canada	Super Gear Fluid	220 (-43)	320 (-37)	460 (-37)
Shell Oils	Omala HD	220 (-43)	320 (-40)	460 (-37)
Texaco Limited	Pinnacle EP	220 (-43)	320 (-43)	460 (-37)
Total	Carter EP/HT	220 (-34)	320 (-31)	460 (-28)
Tribol GmbH	Tribol 1510	220 (-36)	320 (-33)	460 (-28)

Numbers in brackets indicates recommended minimum operating temperature°C

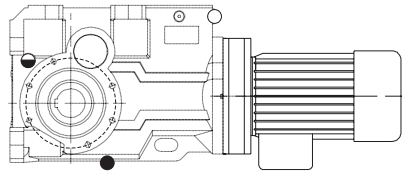
9809

COLUMN 13 ENTRY

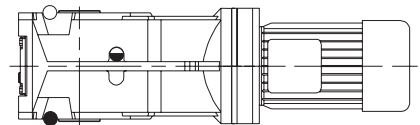
MOUNTING **1**



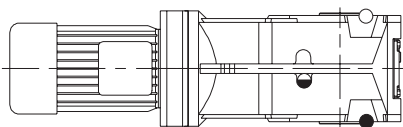
MOUNTING **2**



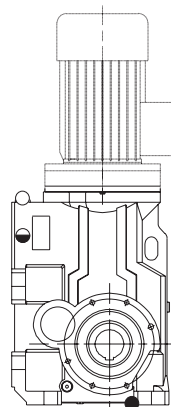
MOUNTING **3**



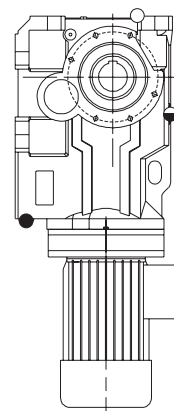
MOUNTING **4**



MOUNTING **5**



MOUNTING **6**



- DRAIN POSITION
- LEVEL POSITION
- VENTILATOR/FILLING POSITION

MOUNTING POSITIONS - SHOWN AS MOTORISED - APPLIES ALSO FOR REDUCERS

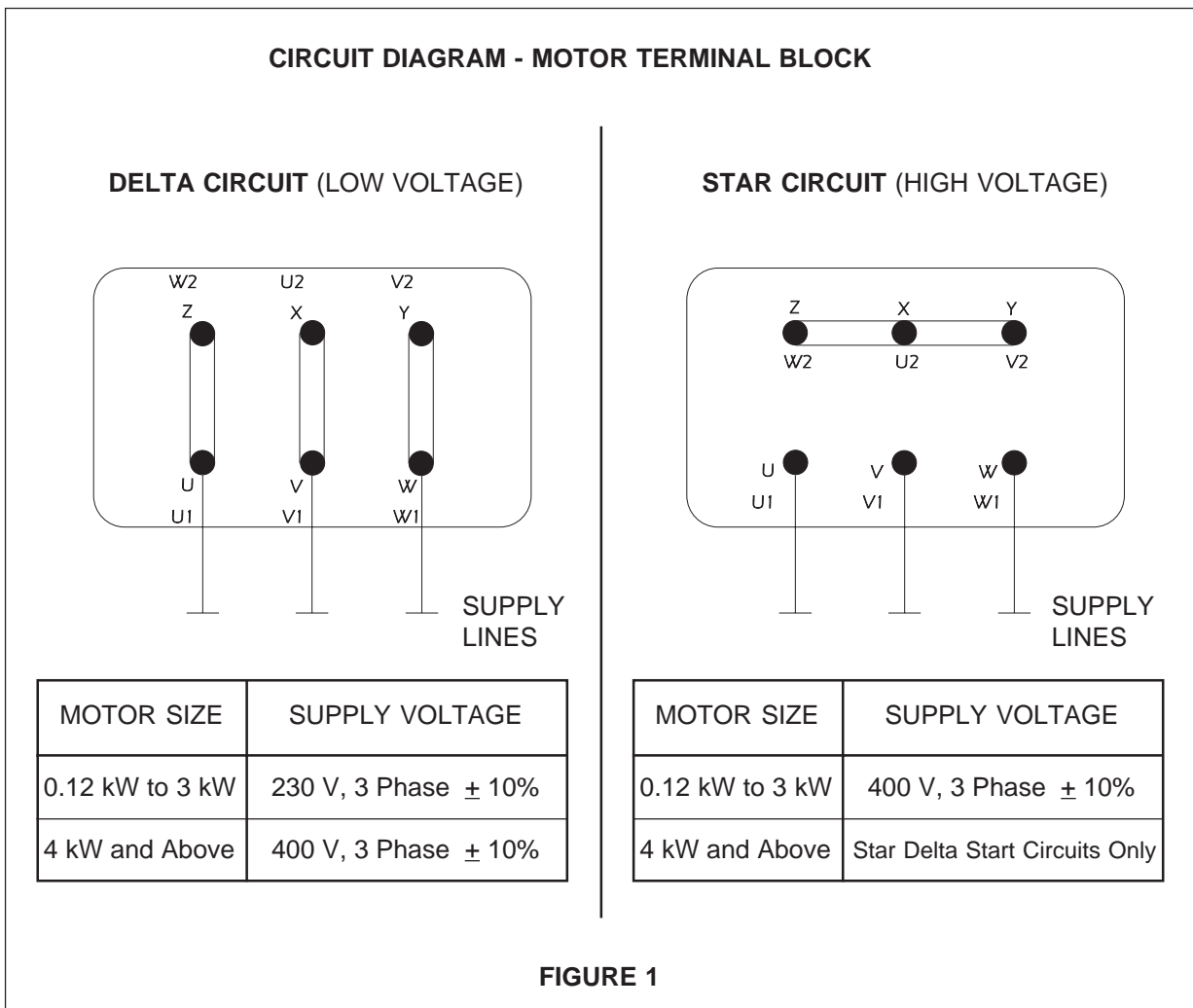
THREE PHASE INDUCTION MOTOR INSTALLATION

CONNECTION TO MAINS POWER SUPPLY

- Connection of the electric motor to the mains supply should be done by a qualified person.
- Connect motor terminals in accordance with the diagram inside the terminal box cover. (Also identified in Fig. 1 on this sheet).

Note: It is important that the mains supply details are checked against the nameplate data and that they are connected as indicated on the nameplate. The correct sizing of the cables to electrical regulations is essential.

- To change the direction of rotation of the electric motor, one of the three main line terminals should be changed with the other.
- Connect the earth conductors to the marked earth terminals.



NOTE: This instruction only applies to David Brown Radicon plated motors. Motors fitted by the customer or requested by the customer of David Brown Radicon from a different manufacturer will have separate documentation provided with it.

9711

INSTALLATION (BRAKE)

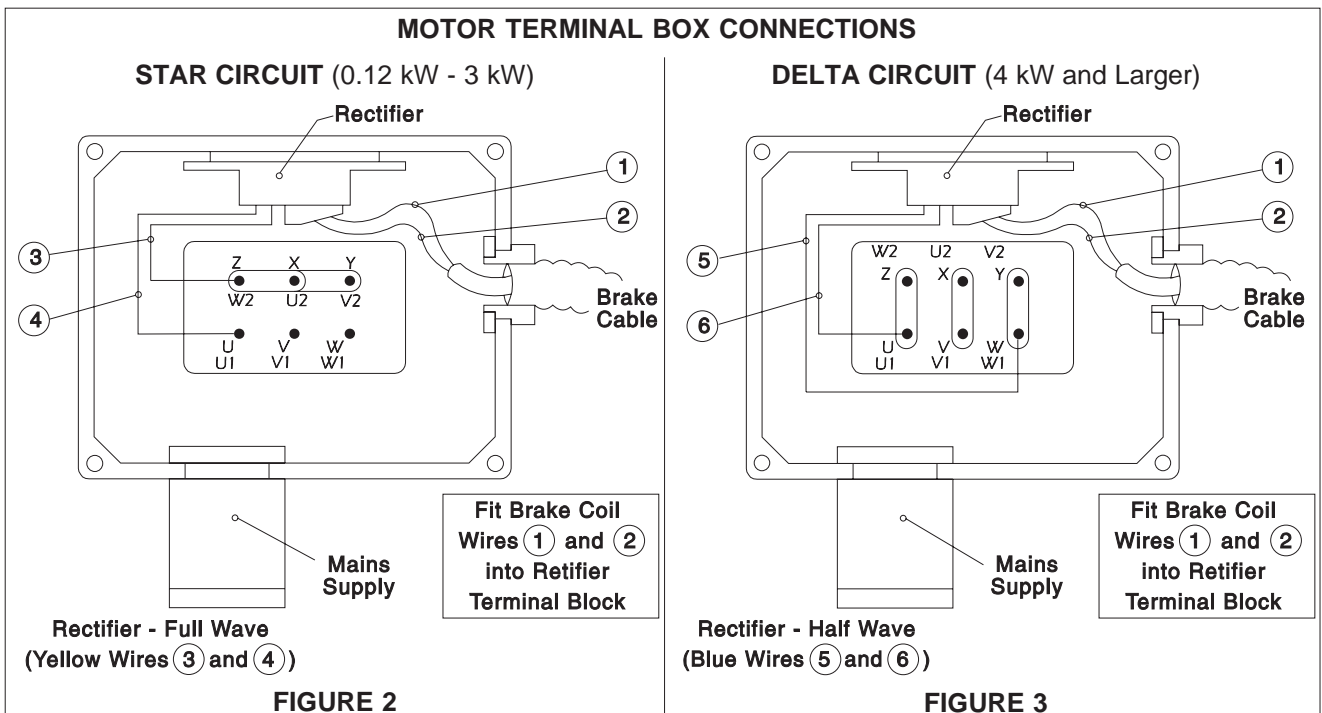
The fail safe brake (Fig 5) is factory fitted to the Radicon Electric Motor.

This includes the fitting of a rectifier and its wiring in the motor terminal box for standard AC switching with a mains supply voltage of 400 V + 10%, 3 phase, 50 HZ.

Installation of the geared motor by the customer requires the normal connection of the motor to the mains supply as indicated in the installation of electric motor section of this manual (Appendix 3).

GENERAL BRAKE APPLICATION (AC SWITCHING)

Figures 2 & 3 are terminal box connection diagrams of the type of rectification used (depending on motor power) with switching on the AC line in parallel with the motor switch contactor, which will satisfy most braking applications.



SPECIAL BRAKING APPLICATIONS (DC SWITCHING)

For fast braking (for safety critical applications, eg lifts, hoists and cranes) it is essential to switch the brake on the DC side of the rectifier, rather than the AC (input) side, as with the standard offering.

At customers request, a special rectifier is supplied with two additional contacts for the inbuilt suppressor, which are connected across the brake switch contacts (Figure 4).

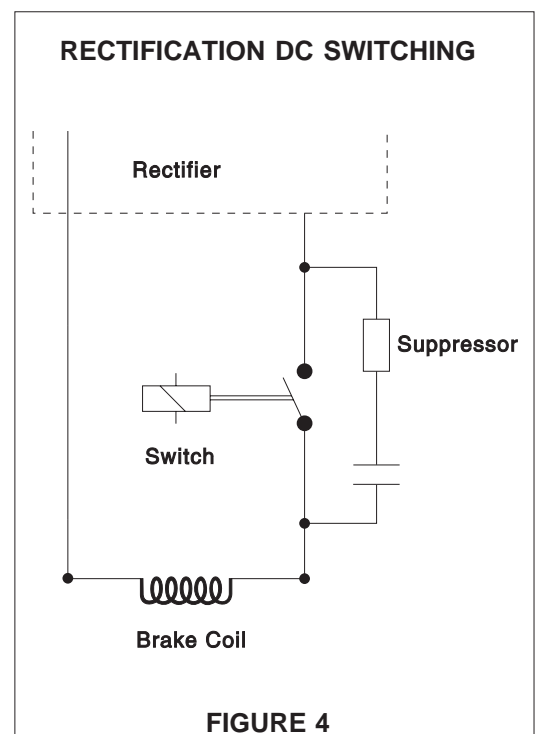
Note: When DC switching is specified, the rectifier is supplied loose in the terminal box. It is the installers responsibility to connect the rectifier which is conventionally located in such cases in the customers control panel.

INVERTER SUPPLY

In all cases, the rectifier must be disconnected from the motor supply terminals, and a constant voltage (400 V ± 10%) supplied independently. It is normal in such cases to re-site the rectifier in the control panel with a separate switching arrangement.

ALTERNATIVE MAINS VOLTAGE

Refer to David Brown Applications Department for guidance.



MAINTENANCE (BRAKE)

To maintain safety and efficient brake action, regular brake inspections are essential. Generally, a three monthly interval is adequate.

NOTE: More frequent inspections should be made for arduous applications (particularly cranes, hoists, lifts or high inertia drives).

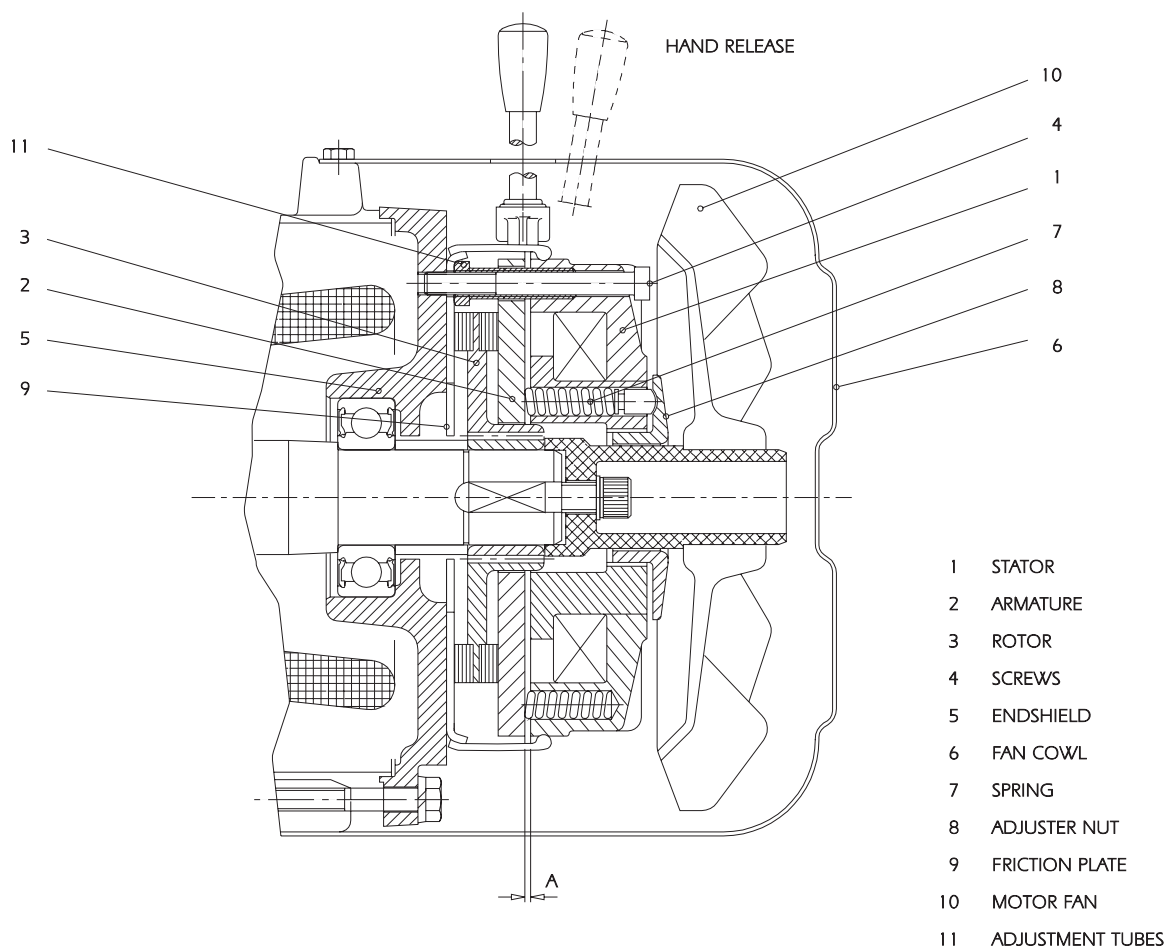


FIGURE 5

CHECKS AND ADJUSTMENTS (Fig 5)

NOTE: To access the brake for inspection remove fan cowl (6), any adjustment may require the removal of the motor fan (10) also.

- 1 Check the brake is free of oil, grease and excess dust.
- 2 Check the maximum air gap 'A' (Fig 5), this must not be exceeded. Use a feeler gauge and check in three positions, ensuring the gap is even (see table 1).

9606

Where adjustment is needed, slacken screws (4) and reset the gap by turning adjustment tubes (11). Re-tighten screws (4) to the correct torques in table 1.

- 3 At the same time as 2, check that the rotor (3) has not worn below the minimum thickness (see table 1)
- 4 If the brake is fitted with a hand release, check the hand release air gap 'U' (Fig 6, and table 1). This is a minimum figure, do not allow smaller settings. To reset this gap tighten the hexagonal hand release nuts (15).

TORQUE ADJUSTMENT

The brake is supplied with nominal torque (table 1) set at the factory. This torque can be reduced by unscrewing the torque nut (8) (Fig 5) using a 'C' spanner to approximately 60% of nominal torque. Torque reduction steps identified in table 1.

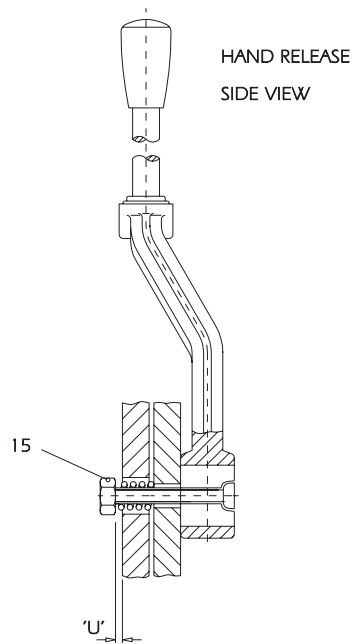


FIGURE 6

TABLE 1

MOTOR FRAME SIZE		63	71	80	90	100/112	132
BRAKE SIZE		06	06	08	10	12	14
BRAKE TORQUE	Nm	2.85	4	8	16	32	60
A	mm	0.2	0.2	0.2	0.2	0.3	0.3
A max	mm	0.5	0.5	0.5	0.5	0.75	0.8
ROTOR BRAKE DISC MIN THICKNESS	mm	4.3	4.3	5.3	7.3	6	6.6
HAND RELEASE CLEARANCE 'U'	mm	1	1	1	1	1	1
BRAKE TORQUE REDUCTION/STEP	Nm	0.2	0.2	0.4	0.6	1.2	1.6
ASSEMBLY KIT BOLTS TIGHTENING TORQUE	Nm	3	3	6	10	10	25

SUPPLIER	LUBRICANT RANGE	ALLOWABLE OPERATING TEMPERATURE RANGE °C	
		ABOVE	TO
BP Oil International Limited	Energrease LS-EP	-30	130
Caltex	Multifak EP	0	120
Castrol International	LMX Grease	-40	150
	Spheerol AP	-30	110
	Spheerol EPL	-10	120
Klüber Lubrication	Klüberlub BE 41-542	-20	140
Mobil Oil Company Limited	Mobilgrease XHP	-15	150
	Mobilith SHC	-20	180
Omega Manufacturing Division	Omega 85	-40	230
Optimol Ölwerke GmbH	Longtime PD	-45	140
Shell Oils	Albida RL	-20	150
	Alvania EP B	-20	120
	Nerita HV	-30	130
Texaco Limited	Multifak All Purpose EP	-30	140

Notes:

- 1) All the above greases are NLGI grade 2.
- 2) Refer to David Brown Radicon Application Engineers if the unit is operating in an ambient temperature outside the range of -30°C to 50°C.

9701

SHAFT ALIGNMENT

Errors of alignment fall into categories of angularity (see figure 1) and eccentricity (see figure 2), or a combination of both.

Errors of angularity should be checked for and corrected before errors of eccentricity.

Alignment in accordance with the following procedure will ensure vibration levels meeting those set out in ISO 10816 Part 1.

Errors of Angularity

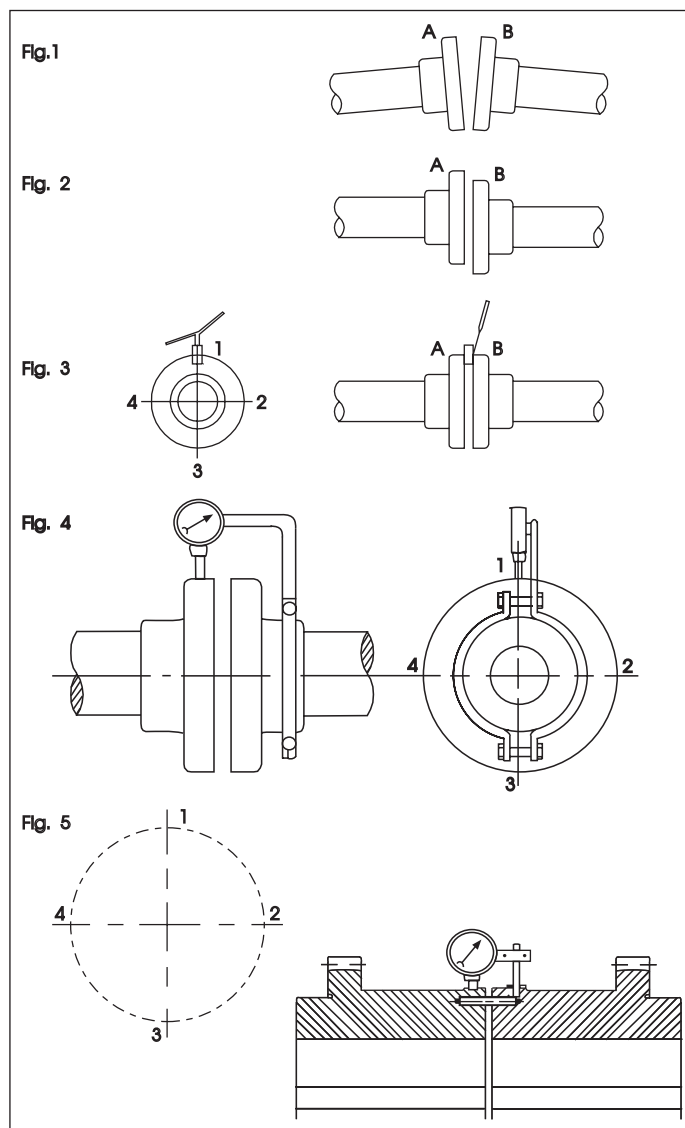
If the faces are perfectly true, the angularity can be checked by keeping both shafts stationary and taking measurements with a block gauge and feelers at the four points 1, 2, 3 and 4 as shown in figure 3. The difference between the readings 1 and 3 will give the error of alignment in the vertical plane, over the length of the shaft equal to the diameter of the coupling flanges, and from this the difference in the relative heights of the feet of the motor or other connected machine can be found by proportion. Similarly the difference between the readings 2 and 4 gives the amount of sideways adjustment necessary to correct any errors of alignment in the horizontal plane.

Generally, however, the coupling faces will not be absolutely true and whilst any errors so found could be allowed for in checking angularity by the stationery method an easier method presents itself. This consists in marking the points 1 on both "A" and "B" and rotating both half couplings, keeping the marked points together. By taking measurements each quarter-revolution the errors in the vertical and horizontal planes are again found.

The permitted angularity error is as follows

TYPE OF COUPLING	ALLOWABLE GAP (G) (mm)
Flexible coupling with rubber elements or Double engagement gear type couplings	$G = 0.002 D$
Single engagement gear type coupling	$G = 0.001 D$
Rigid coupling	$G = 0.0005 D$

NOTE: D is the diameter (mm) at which the gap is measured.



NOTE: Check the alignment after running the unit until it has attained its normal working temperature. Any discrepancies can then be rectified.

Errors of Eccentricity

The procedure for measuring eccentricity is precisely analogous to that used for angularity. In this case, however the measurements are taken in radial direction and the most convenient and accurate means of doing this consists of the use of a dial indicator suitably clamped to one half coupling, and bearing on the hub or flange of the other, as shown in figures 4 and 5 on page 15.

Care must, however, be taken to ensure the support for the dial indicator is sufficiently rigid to prevent the weight of the indicator from causing deflection and, in consequence, inaccurate readings. Extra care should be taken where taper roller bearings are fitted to ensure that alignment is checked with shafts in mid-point position and a final check made with the unit at operating temperature.

The permitted eccentricity error which can be accommodated in addition to that of the angularity error is as follows :-

TYPE OF COUPLING	UNIT SIZE	ALLOWABLE ECCENTRICITY (mm)
Flexible or rubber element	K08	0.180
	K09	0.200
	K10	0.230
	K12	0.250
Gear type	K08	0.050
	K09 to K12	0.075
Rigid	K08	0.025
	K09 to K12	0.030

SPECIAL NOTE CONCERNING RIGID COUPLINGS

In lining up elements involving rigid couplings it is important that no attempt is made to correct errors of alignment or eccentricity greater than those above by tightening of the coupling bolts (This applies when the system is cold or at operating temperature). The result is mis-alignment and the setting up of undue stresses in the shaft, coupling and bearings. This will be revealed by the springing apart of the coupling faces if the bolts are slackened off. A check on the angularity of a pre-assembled job, after bolting down, can be obtained in the case of rigid couplings by slackening off the coupling bolts, when any mis-alignment will cause the coupling faces to spring apart. This check may not, however, reveal any strains due to eccentricity owing to the constant restraint imposed by the spigot.

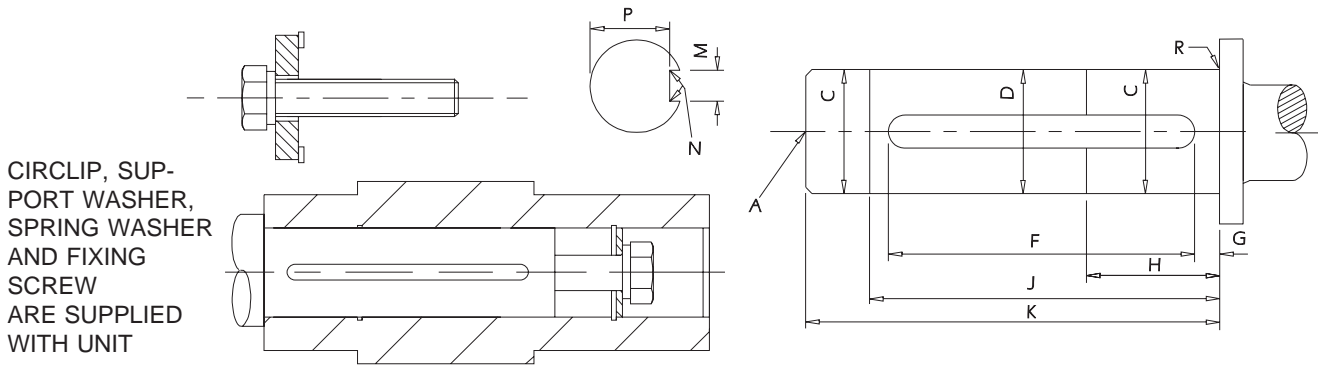
SERIES X COUPLINGS

David Brown Radicon Limited, produce standard flexible couplings to cover the complete range of Radicon units as follows:

NYLICON	couplings, type 600 designed for fractional and small power drives up to a maximum torque of 465 Nm.
CONE RING	couplings, type 611, 612, 613 and 614 designed for medium or heavy duty use. They are of the pin and bush type with bore sizes from 19 to 170 mm diameter.
GEAR TYPE	couplings, types 621, 622 and 623 of single and double engagement types covering flange and sleeve designs. Hardened hubs are profile ground, fully crowned and chamfered. External dimensions are metric.
RIGID TYPE	couplings, type 629 with bore sizes up to 280 mm diameter.

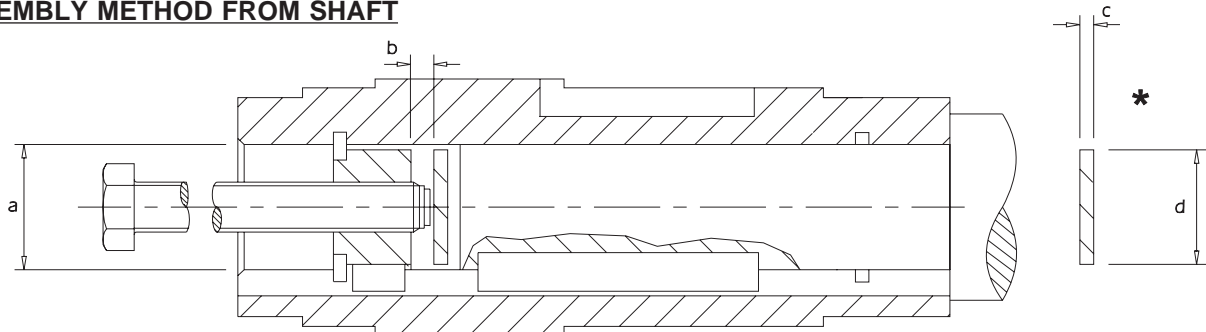
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ASSEMBLY ONTO SHAFT - CUSTOMERS SHAFT DETAIL

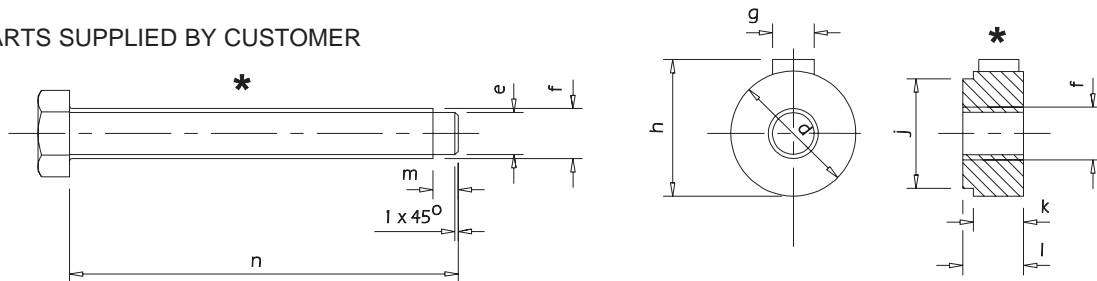


SIZE	A	C	D	F	G	H	J	K	M	N	P	R
K08	M20x 2.5 42 deep	59.990 / 59.971	59.6	148.5 148.0	3	90	143	173	18.000 / 17.957	0.40 0.25R	53.0 52.8	0.8R
K09	M20 x 2.5P 42 deep	69.990 / 69.971	69.6	161.5 161.0	3	105	197	232	20.000 / 19.948	0.6 0.4R	62.5 62.3	0.8R
K10	M20 x 2.5P 42 deep	79.990 / 79.971	79.6	188.5 188.0	5	120	235	275	22.000 / 21.948	0.6 0.4R	71.0 70.8	0.8R
K12	M24 x 3 50 deep	99.988/ 99.966	99.6	238.5 238.0	10	150	277	327	28.000/ 27.948	0.4 0.4R	90.0 89.8	0.8R

DISASSEMBLY METHOD FROM SHAFT



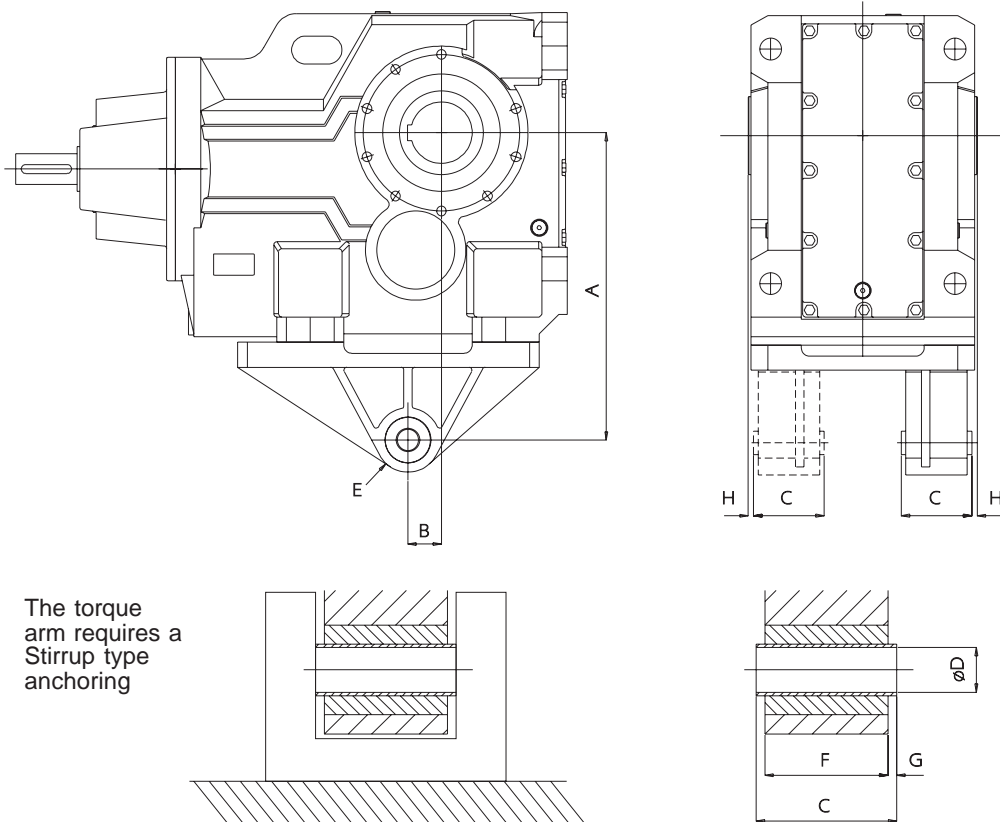
* PARTS SUPPLIED BY CUSTOMER



SIZE	a	b	c	d	e	f	g	h	j	k	l	m	n
K08	60	5.00	8	59.9	26	M30 x 1.5	18	64	47.4	24	27	5	250
K09	70	6.05	8	69.9	26	M30 x 1.5	20	74.5	56.4	24	27	5	310
K10	80	6.00	8	79.9	26	M30 x 1.5	22	95	75.3	24	27	5	360
K12	100	8.00	8	99.9	32	M36 x 1.5	28	116	84.1	30	34	5	420

K			0			T
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STANDARD UNIT WITH TORQUE BRACKET



SIZE	A	B	C	øD	E	F	G	H
K08	300	60	80	25.25	40	70	5	30
				24.75				
K09	350	70	100	25.25	40	90	5	40
				24.75				
K10	450	74	100	25.25	40	90	5	45
				24.75				
K12	550	60	126	38.25	58	110	8	10
				37.75				

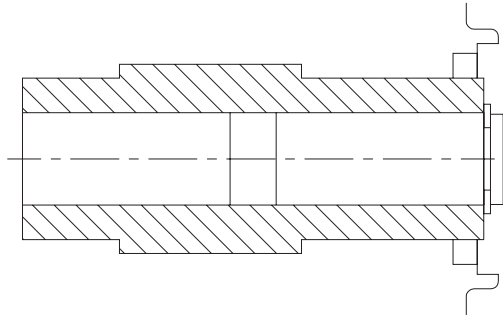
NOTES:

It is recommended that the torque arm is fitted on the side of the unit adjacent to the driven machine.

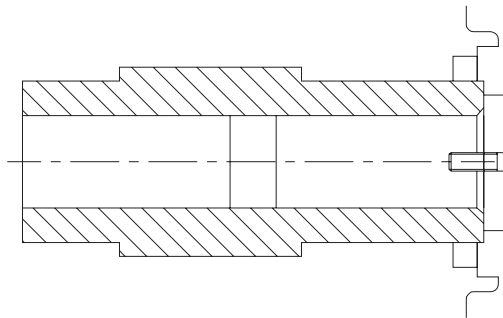
The use of a fitted bolt is recommended.

9610

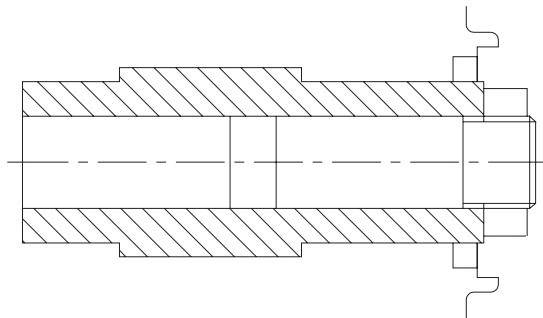
SHAFT MOUNT UNITS
ALTERNATIVE SHAFT FIXING METHODS



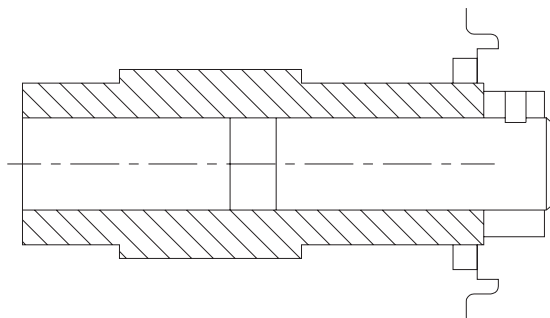
SHAFT MOUNT UNITS RETAINED WITH A
CIRCLIP



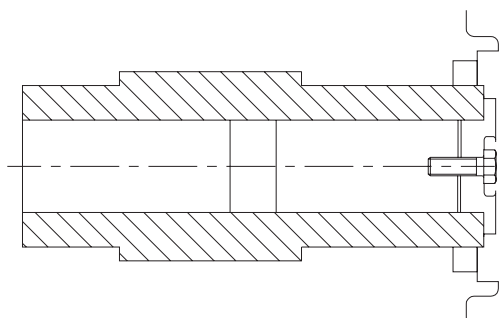
SHAFT MOUNT UNITS RETAINED WITH A
BOLT AND PLATE



SHAFT MOUNT UNITS RETAINED WITH A
LOCKNUT



SHAFT MOUNT UNITS RETAINED WITH A
COLLAR AND GRUBSCREW



SHAFT MOUNT UNITS RETAINED WITH A
RECESSED PLATE AND BOLT

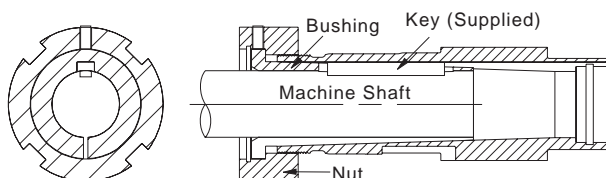
Installation

- 1) Thoroughly clean and degrease, machine shaft, bushing and gear unit tapered bore using Lowtox or Loctite 7061 Superclean.

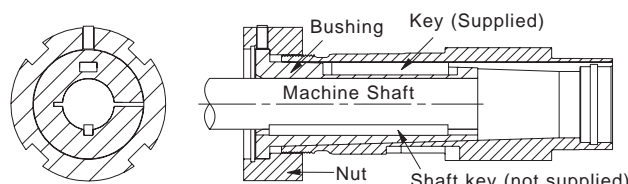
Note: the bushing nut threads are coated with anti seize compound at the factory, this should not be removed (if re-installing previously used nut, re-coat threads with anti-seize compound).

- 2)

Thin walled bushing



Thick walled bushing



Thin walled bushing (keyway slot through bushing wall)

Slide bushing assembly (bush and nut) onto machine shaft, nut end first, position the keyway slot with keyway in machine shaft (the bushing may need to be pried open slightly) insert the drive key supplied with the bushing.

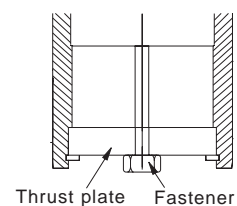
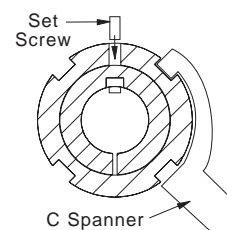
Thick walled bushing (with separate internal and external keyways)

Insert key (not supplied) into machine shaft (if shaft has open ended keyway secure key to prevent axial movement) slide bushing assembly (bush and nut) onto machine shaft, nut end first (the bushing may need to be pried open slightly) insert the drive key supplied with the bushing

- 3) Slide gear unit onto driven shaft and bushing taper taking care that key seats into unit keyway, hand tighten nut, (ensure gear unit is in correct axial location) lock the driven shaft and use 'C' spanner or pipe wrench to tighten bushing nut to torque value listed in table 1 below, Do not overtighten. Secure the bushing nut by locking with setscrew.

Alternative method (only use if torque cannot be measured)

Use wrench to tighten bushing nut gently until the gear unit cannot be moved axially along the shaft by hand, loosen bushing nut but do not dislodge unit from taper, re-tighten bushing nut by hand, lock the driven shaft and use 'C' spanner or pipe wrench to tighten bushing nut as listed in table 1 below, secure the bushing nut by locking with setscrew.



Vertical Application

If the gear unit is mounted vertically below the driven machine, a shouldered machine shaft together with a thrust plate and fastener should be used. Secure bushing nut then torque tighten thrust plate fastener as table 2 below.

Removal

Caution the gear unit must be supported during removal process

- 1) Loosen setscrew on OD of bushing nut
- 2) Use 'C' spanner or pipe wrench to remove bushing nut.

Table 1 'C' Spanner wrench type and bushing nut Tightening Torque

Size	'C' Spanner Size	Bushing Nut Tightening Torque (Nm)	No of turns (only use if torque cannot be measured)
K08 (207)TR	4 1/2" - 6 1/4"	225	1/2 turn of nut
K09 (215)TR	4 1/2" - 6 1/4"	340	
K10 (307)TR	4 1/2" - 6 1/4"	340	
K12 (315)TR	6 1/8" - 8 3/4"	340	

Table 2 Thrust plate fastener data (secure fasteners with Loctite 242)

Size	Fastener Size	Torque (Nm)
K08 (207)TR	M16 x 2p	250
K09 (215)TR	M20 x 2.5p	725
K10 (307)TR	M24 x 2.5p	1075
K12 (315)TR	M24 x 2.5p	1075