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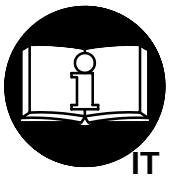
OPERATION AND MAINTENANCE MANUAL FOR SERIES 7L ANGLE DRILLS

NOTICE

Series 7L Angle Drills are designed for drilling operations in the aerospace, automotive, appliance, electronic, machining and furniture industries.

Ingersoll–Rand is not responsible for customer modification of tools for applications on which Ingersoll–Rand was not consulted.



⚠ WARNING

IMPORTANT SAFETY INFORMATION ENCLOSED.
READ THIS MANUAL BEFORE OPERATING TOOL.
IT IS THE RESPONSIBILITY OF THE EMPLOYER TO PLACE THE INFORMATION IN THIS MANUAL INTO THE HANDS OF THE OPERATOR.
FAILURE TO OBSERVE THE FOLLOWING WARNINGS COULD RESULT IN INJURY.

PLACING TOOL IN SERVICE

- **Always operate, inspect and maintain this tool in accordance with American National Standards Institute Safety Code for Portable Air Tools (ANSI B186.1).**
- **For safety, top performance, and maximum durability of parts, operate this tool at 90 psig (6.2 bar/620 kPa) maximum air pressure at the inlet with 3/8" (10 mm) inside diameter air supply hose.**
- **Always turn off the air supply and disconnect the air supply hose before installing, removing or adjusting any accessory on this tool, or before performing any maintenance on this tool.**
- **Do not use damaged, frayed or deteriorated air hoses and fittings.**
- **Be sure all hoses and fittings are the correct size and are tightly secured. See Dwg. TPD905–1 for a typical piping arrangement.**
- **Always use clean, dry air at 90 psig maximum air pressure. Dust, corrosive fumes and/or excessive moisture can ruin the motor of an air tool.**
- **Do not lubricate tools with flammable or volatile liquids such as kerosene, diesel or jet fuel.**
- **Do not remove any labels. Replace any damaged label.**

USING THE TOOL

- **Always wear eye protection when operating or performing maintenance on this tool.**
- **Always wear hearing protection when operating this tool.**
- **Keep hands, loose clothing and long hair away from rotating end of tool.**
- **Anticipate and be alert for sudden changes in motion during start up and operation of any power tool.**
- **Keep body stance balanced and firm. Do not overreach when operating this tool. High reaction torques can occur at or below the recommended air pressure.**
- **Tool accessories may continue to rotate briefly after throttle is released.**
- **Air powered tools can vibrate in use. Vibration, repetitive motions or uncomfortable positions may be harmful to your hands and arms. Stop using any tool if discomfort, tingling feeling or pain occurs. Seek medical advice before resuming use.**
- **Use accessories recommended by Ingersoll–Rand.**
- **Whenever the Angle Head is installed or repositioned, the Throttle Lever must be positioned so that reaction torque will not tend to retain the throttle in the "ON" position.**
- **This tool is not designed for working in explosive atmospheres.**
- **This tool is not insulated against electric shock.**

NOTICE

The use of other than genuine Ingersoll–Rand replacement parts may result in safety hazards, decreased tool performance, and increased maintenance, and may invalidate all warranties.

Repairs should be made only by authorized trained personnel. Consult your nearest Ingersoll–Rand Authorized Servicenter.

Refer All Communications to the Nearest Ingersoll–Rand Office or Distributor.

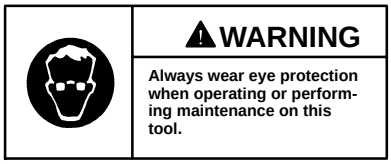
Printed in U.S.A.

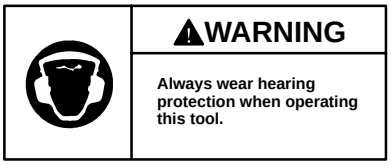
Ingersoll-Rand®

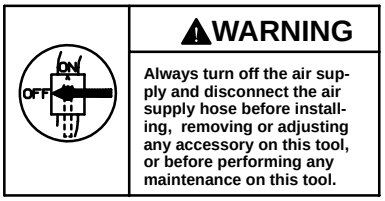
WARNING LABEL IDENTIFICATION

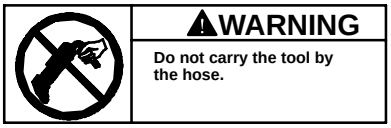
⚠ WARNING

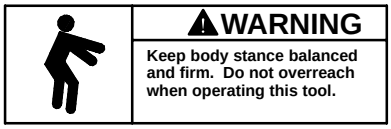
FAILURE TO OBSERVE THE FOLLOWING WARNINGS COULD RESULT IN INJURY.

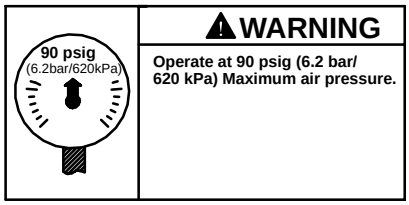












PLACING TOOL IN SERVICE

LUBRICATION

Ingersoll–Rand No. 10 **Ingersoll–Rand No. 28**
Ingersoll–Rand No. 67

Always use an air line lubricator with this tool.
We recommend the following Filter–Lubricator–Regulator Unit:

USA – No. C18–03–FKG0–28

Motor

Before starting the Tool and after each eight hours of operation, unless the air line lubricator is used, detach the air hose and inject a few drops of Ingersoll–Rand No. 10 Oil into the air inlet.

Gearing

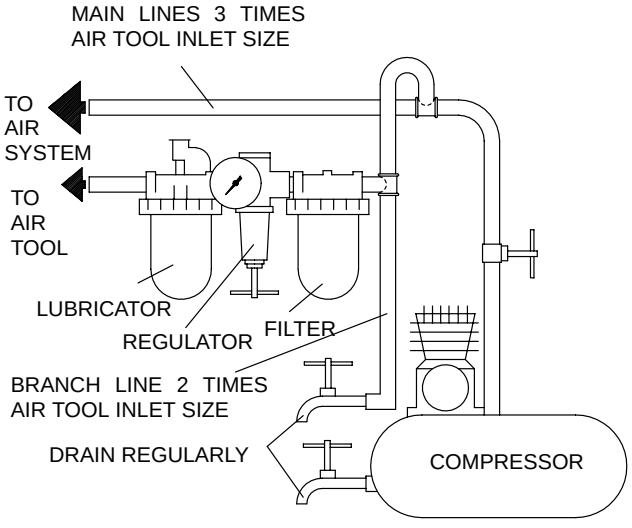
For models with H, J, K, or L gearing, after each 50,000 cycles or 160 hours of operation, whichever comes first, inject approximately 6 cc of Ingersoll–Rand No. 28 Grease into the Grease Fitting.

For models with M or N gearing, after each 50,000 cycles or 160 hours of operation, whichever comes first, inject approximately 9 cc of Ingersoll–Rand No. 28 Grease into the Grease Fitting.

Angle Head

For models with 7L1A1, 7L1A3, 7L1A4, 7L1B1 and 7L1B4 Angle Attachment, after each 8 hours of operation, inject 0.5 – 1.0 cc of Ingersoll–Rand No. 67 Grease into Grease Fitting.

For models with 7L2A4 or 7L3A4 Angle Attachment, after each 40 hours of operation, inject 0.5 – 1.0 cc of Ingersoll–Rand No. 67 Grease into Grease Fitting (102).



(Dwg. TPD905–1)

HOW TO ORDER AN ANGLE DRILL

LEVER THROTTLE ANGLE DRILLS

Model	Free Speed rpm	Stall Torque in–lb	Stall Torque Nm	Female Threaded Spindle
7LH1A1	6,000	31	3.5	1/4–28
7LJ1A1	4,000	40	4.5	1/4–28
7LK1A1	3,200	57	6.4	1/4–28

Model	Free Speed rpm	Stall Torque in–lb	Stall Torque Nm	Chuck Capacity in.	Chuck Capacity mm
7LJ2A41	3,250	51	5.80	1/4	6
7LL3A42	1,550	105	11.87	3/8	10
7LM3A43	900	170	19.21	3/8	10
7LN3A44	600	255	28.82	1/2	12

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MANUEL D'EXPLOITATION ET D'ENTRETIEN DES PERCEUSES D'ANGLE DE LA SÉRIE 7L

NOTE

Les perceuses d'angle de la Série 7L sont destinées aux opérations de perçage dans les industries de l'aérospatiale, de l'automobile, des appareils ménagers, de l'électronique, de l'usinage et des meubles.

Ingersoll–Rand ne peut être tenu responsable de la modification des outils par le client pour les adapter à des applications qui n'ont pas été approuvées par Ingersoll–Rand.

⚠ ATTENTION

**D'IMPORTANTES INFORMATIONS DE SÉCURITÉ SONT JOINTES.
LIRE CE MANUEL AVANT D'UTILISER L'OUTIL.**

**LE NON RESPECT DES AVERTISSEMENTS SUIVANTS PEUT CAUSER DES BLESSURES.
L'EMPLOYEUR EST TENU DE COMMUNIQUER LES INFORMATIONS
DE CE MANUEL AUX EMPLOYÉS UTILISANT CET OUTIL.**

MISE EN SERVICE DE L'OUTIL

- **Toujours exploiter, inspecter et entretenir cet outil conformément au Code de sécurité des outils pneumatiques portatifs de l'American National Standards Institute (ANSI B186.1).**
- **Pour la sécurité, les performances optimales et la durabilité maximale des pièces, cet outil doit être connecté à une alimentation d'air comprimé de 6,2 bar (620 kPa) maximum à l'entrée, avec un flexible de 10 mm de diamètre intérieur.**
- **Couper toujours l'alimentation d'air comprimé et débrancher le flexible d'alimentation avant d'installer, déposer ou ajuster tout accessoire sur cet outil, ou d'entreprendre une opération d'entretien quelconque sur l'outil.**
- **Ne pas utiliser des flexibles ou des raccords endommagés, effilochés ou détériorés.**
- **S'assurer que tous les flexibles et les raccords sont correctement dimensionnés et bien serrés. Voir Plan TPD905–1 pour un exemple type d'agencement des tuyauteries.**
- **Utiliser toujours de l'air sec et propre à une pression maximum de 6,2 bar. La poussière, les fumées corrosives et/ou une humidité excessive peuvent endommager le moteur d'un outil pneumatique.**
- **Ne jamais lubrifier les outils avec des liquides inflammables ou volatiles tels que le kérosène, le gasoil ou le carburant d'aviation.**
- **Ne retirer aucune étiquette. Remplacer toute étiquette endommagée.**

UTILISATION DE L'OUTIL

- **Porter toujours des lunettes de protection pendant l'utilisation et l'entretien de cet outil.**
- **Porter toujours une protection acoustique pendant l'utilisation de cet outil.**
- **Tenir les mains, les vêtements flous et les cheveux longs, éloignés de l'extrémité rotative de l'outil.**
- **Prévoir, et ne pas oublier, que tout outil motorisé est susceptible d'à–coups brusques lors de sa mise en marche et pendant son utilisation.**
- **Garder une position équilibrée et ferme. Ne pas se pencher trop en avant pendant l'utilisation de cet outil. Des couples de réaction élevés peuvent se produire à, ou en dessous, de la pression d'air recommandée.**
- **La rotation des accessoires de l'outil peut continuer pendant un certain temps après le relâchement de la gâchette.**
- **Les outils pneumatiques peuvent vibrer pendant l'exploitation. Les vibrations, les mouvements répétitifs et les positions inconfortables peuvent causer des douleurs dans les mains et les bras. N'utiliser plus d'outils en cas d'inconfort, de picotements ou de douleurs. Consulter un médecin avant de recommencer à utiliser l'outil.**
- **Utiliser les accessoires recommandés par Ingersoll-Rand.**
- **A chaque fois que le renvoi d'angle est installé ou repositionné, le levier de commande doit être positionné de manière à ce que le couple de réaction n'ait pas tendance à maintenir le levier de commande en position "MARCHE".**
- **Cet outil n'est pas conçu pour fonctionner dans des atmosphères explosives.**
- **Cet outil n'est pas isolé contre les chocs électriques.**

NOTE

L'utilisation de rechanges autres que les pièces d'origine Ingersoll–Rand peut causer des risques d'insécurité, réduire les performances de l'outil et augmenter l'entretien, et peut annuler toutes les garanties.

Les réparations ne doivent être effectuées que par des réparateurs qualifiés autorisés. Consultez votre Centre de Service Ingersoll–Rand le plus proche.

Adressez toutes vos communications au Bureau Ingersoll–Rand ou distributeur le plus proche.

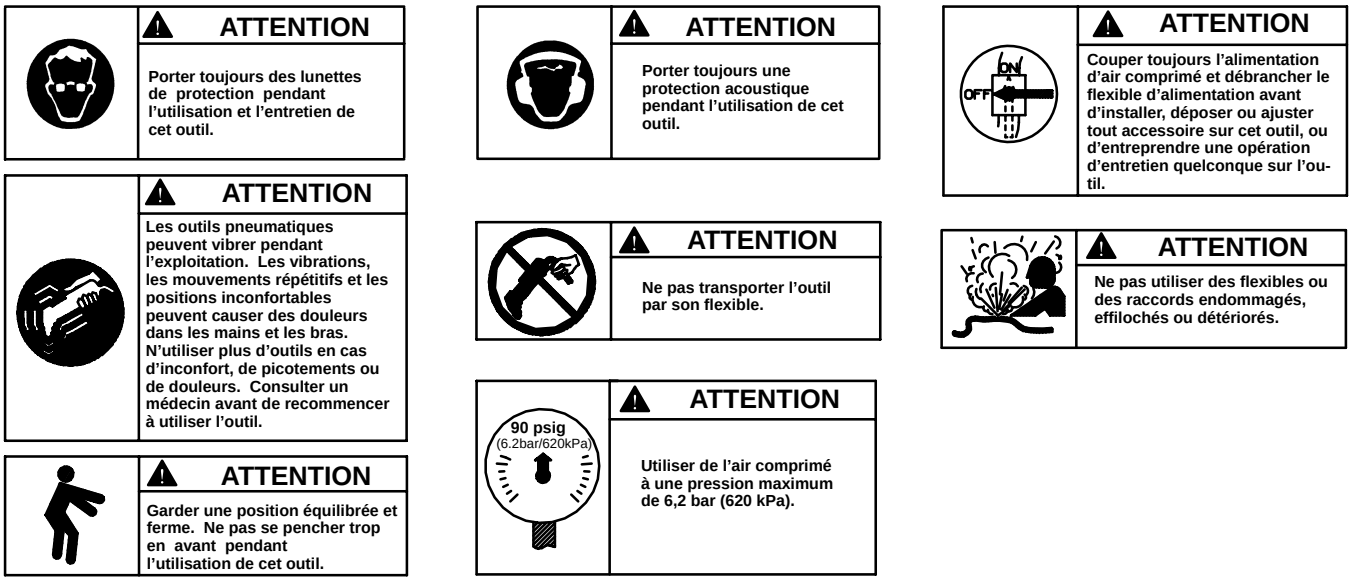
Imprimé aux É.U.

Ingersoll-Rand®

SIGNIFICATION DES ÉTIQUETTES D'AVERTISSEMENT

⚠ ATTENTION

LE NON RESPECT DES AVERTISSEMENTS SUIVANTS PEUT CAUSER DES BLESSURES.



MISE EN SERVICE DE L'OUTIL

LUBRIFICATION

Ingersoll–Rand No. 10

Ingersoll–Rand No. 28
Ingersoll–Rand No. 67

Utiliser toujours un lubrificateur avec cet outil. Nous recommandons l'emploi du filtre–régulateur–lubrificateur suivant :

É.U. – No. C18–03–FKG0–28

Moteur

Avant de mettre l'outil en marche et tous les huit heures de fonctionnement, si un lubrificateur de ligne n'est pas utilisé, débrancher le flexible d'alimentation et injecter plusieurs gouttes d'huile Ingersoll–Rand No. 10 dans le raccord d'admission.

Pignonnerie

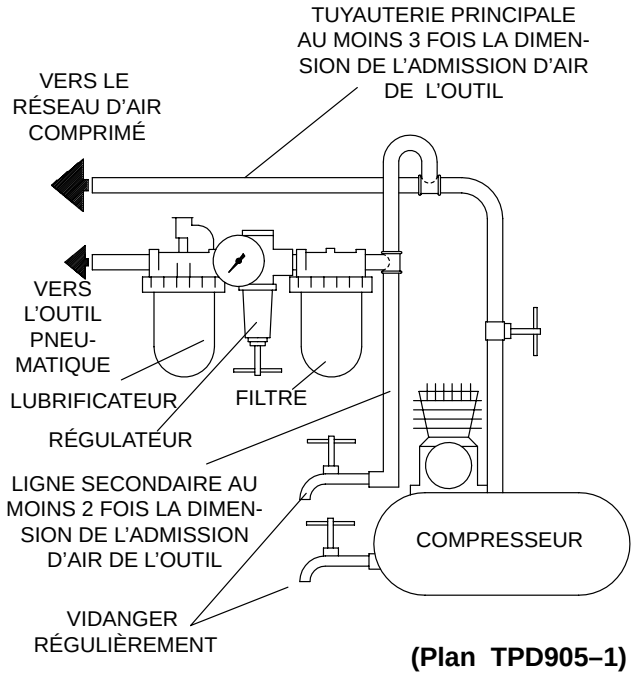
Pour les modèles équipés de la pignonnerie H, J, K ou L, tous les 50.000 cycles ou 160 heures de fonctionnement, selon le cas, injecter environ 6 cm^3 de graisse Ingersoll–Rand No. 28 dans le raccord de graissage.

Pour les modèles équipés de la pignonnerie M ou N, tous les 50.000 cycles ou 160 heures de fonctionnement, selon le cas, injecter environ 9 cm^3 de graisse Ingersoll–Rand No. 28 dans le raccord de graissage.

Renvoi d'angle

Sur les renvois d'angle 7L1A1, 7L1A3, 7L1A4, 7L1B1 et 7L1B4, injecter 0,5 à 1 cm^3 de graisse Ingersoll–Rand No. 67 dans le raccord de graissage **toutes les huit heures de fonctionnement**.

Sur les renvois d'angle 7L2A4 ou 7L3A4, injecter 0,5 à 1 cm^3 de graisse Ingersoll–Rand No. 67 dans le raccord de graissage **toutes les quarante heures de fonctionnement**.



(Plan TPD905–1)

SPÉCIFICATIONS

Modèle	Vitesse à vide	Couple de Calage		Filetage intérieur
	tr/mn	pouces–lb	Nm	Broche
7LH1A1	6.000	31	3,5	1/4–28
7LJ1A1	4.800	40	4,5	1/4–28
7LK1A1	3.200	57	6,4	1/4–28

Modèle	Vitesse à vide	Couple de Calage		Capacité du mandrin	
	tr/mn	pouces–lb	Nm	pouces	mm
7LJ2A41	3.250	51	5,80	1/4	6
7LL3A42	1.550	105	11,87	3/8	10
7LM3A43	900	170	19,21	3/8	10
7LN3A44	600	255	28,82	1/2	12

MANUAL DE FUNCIONAMIENTO Y MANTENIMIENTO
TALADROS ANGULARES DE LA SERIE 7L

E

NOTA

Los taladros angulares de la serie 7L están diseñados para operaciones de taladrado en las industrias aeroespacial, del automóvil, de electrodomésticos, electrónica, mecánica y del mueble. Ingersoll–Rand no aceptará responsabilidad alguna por la modificación de las herramientas efectuada por el cliente para las aplicaciones que no hayan sido consultadas con Ingersoll–Rand.

⚠ AVISO

**SE ADJUNTA INFORMACIÓN IMPORTANTE DE SEGURIDAD.
LEA ESTE MANUAL ANTES DE UTILIZAR LA HERRAMIENTA.
ES RESPONSABILIDAD DE LA EMPRESA ASEGURARSE DE QUE EL OPERARIO ESTÉ AL TANTO DE LA INFORMACIÓN QUE CONTIENE ESTE MANUAL.
EL HACER CASO OMISO DE LOS AVISOS SIGUIENTES PODRÍA OCASIONAR LESIONES.**

PARA PONER LA HERRAMIENTA EN SERVICIO

- **Utilice, examine y mantenga siempre esta herramienta conforme al código de seguridad para herramientas neumáticas portátiles de la American National Standards Institute (ANSI B186.1).**
- **Para mayor seguridad, rendimiento óptimo y larga vida útil de las piezas, utilice esta herramienta a una presión de aire máxima de 90 psig (6,2 bar/620 Pa) con una manguera de suministro de aire con diámetro interno de 10 mm.**
- **Corte siempre el suministro de aire y desconecte la manguera de suministro de aire antes de instalar, desmontar o ajustar cualquier accesorio de esta herramienta, o antes de realizar cualquier operación de mantenimiento de la misma.**
- **No utilice mangueras de aire y racores dañados, desgastados o deteriorados.**
- **Asegúrese de que todos los racores y mangueras sean del tamaño correcto y estén bien apretados. El Esq. TPD905–1 muestra una disposición característica de las tuberías.**
- **Use siempre aire limpio y seco a una presión máxima de 90 psig (6,2 bar/620 kPa). El polvo, los gases corrosivos y el exceso de humedad pueden estropear el motor de una herramienta neumática.**
- **No lubrique las herramientas con líquidos inflamables o volátiles tales como queroseno, gasoil o combustible para motores a reacción.**
- **No saque ninguna etiqueta. Sustituya toda etiqueta dañada.**

UTILIZACIÓN DE LA HERRAMIENTA

- **Use siempre protección ocular cuando utilice esta herramienta o realice operaciones de mantenimiento en la misma.**
- **Use siempre protección para los oídos cuando utilice esta herramienta.**
- **Mantenga las manos, la ropa suelta y el cabello largo alejados del extremo giratorio de la herramienta.**
- **Anticipe y esté atento a los cambios repentinos en el movimiento durante la puesta en marcha y utilización de toda herramienta motorizada.**
- **Mantenga una postura del cuerpo equilibrada y firme. No estire demasiado los brazos al manejar la herramienta. Pueden darse elevados pares de reacción a la presión de aire recomendada, e incluso a presiones inferiores.**
- **Los accesorios de la herramienta podrían seguir girando brevemente después de haberse soltado la palanca de mando.**
- **Las herramientas neumáticas pueden vibrar durante el uso. La vibración, los movimientos repetitivos o las posiciones incómodas pueden dañarle los brazos y manos. En caso de incomodidad, sensación de hormigueo o dolor, deje de usar la herramienta. Consulte con el médico antes de volver a utilizarla.**
- **Utilice únicamente los accesorios Ingersoll–Rand recomendados.**
- **Cuando se instale o reposicione la cabeza angular, la palanca de mando deberá colocarse de forma que la reacción de par no tienda a retener el mando en la posición de "ON" (ACCIONAMIENTO).**
- **Esta herramienta no ha sido diseñada para trabajar en ambientes explosivos.**
- **Esta herramienta no está aislada contra descargas eléctricas.**

NOTA

El uso de piezas de recambio que no sean las auténticas piezas Ingersoll–Rand puede poner en peligro la seguridad, reducir el rendimiento de la herramienta y aumentar los cuidados de mantenimiento necesarios, así como invalidar toda garantía.

Las reparaciones sólo se deben encomendar a personal debidamente cualificado y autorizado. Consulte con el centro de servicio autorizado Ingersoll–Rand más próximo.

Toda comunicación se deberá dirigir a la oficina o al distribuidor Ingersoll–Rand más próximo.

Impreso en EE. UU.

Ingersoll-Rand®

ETIQUETAS DE AVISO

⚠ AVISO

EL HACER CASO OMISO DE LOS AVISOS SIGUIENTES PODRÍA OCASIONAR LESIONES.

⚠ ADVERTENCIA

Use siempre protección ocular cuando utilice esta herramienta o realice operaciones de mantenimiento en la misma.

⚠ ADVERTENCIA

Las herramientas neumáticas pueden vibrar durante el uso. La vibración, los movimientos repetitivos o las posiciones incómodas podrían dañarle los brazos y las manos. En caso de incomodidad, sensación de hormigueo o dolor, dejar de usar la herramienta. Consultar al médico antes de volver a utilizarla.

⚠ ADVERTENCIA

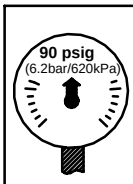
Mantener una postura del cuerpo equilibrada y firme. No estirar demasiado los brazos al manejar la herramienta.

⚠ ADVERTENCIA

Use siempre protección para los oídos cuando utilice esta herramienta.

⚠ ADVERTENCIA

No coger la herramienta por la manguera para levantarla.



⚠ ADVERTENCIA

Manejar la herramienta a una presión de aire máxima de 90 psig (6,2 bar/620 kPa).

⚠ ADVERTENCIA

Cortar siempre el suministro de aire y desconectar la manguera de suministro de aire antes de instalar, retirar o ajustar cualquier accesorio de esta herramienta, o antes de realizar cualquier operación de mantenimiento de la misma.

⚠ ADVERTENCIA

No utilizar mangueras de aire y accesorios dañados, desgastados ni deteriorados.

PARA PONER LA HERRAMIENTA EN SERVICIO

LUBRICACIÓN

Ingersoll–Rand Nº 10

Ingersoll–Rand Nº 28
Ingersoll–Rand Nº 67

Utilice siempre un lubricador de aire comprimido con esta herramienta.
Recomendamos utilizar el siguiente conjunto de filtro–lubricador–regulador:

EE. UU. – Nº C18–03–FKG0–28

Motor

Antes de poner la herramienta en marcha, y después de cada ocho horas de funcionamiento, a menos que se haya puesto un lubricador de línea de aire, desconecte la manguera de aire e inyecte unas gotas de aceite Ingersoll–Rand No. 10 en la admisión de aire.

Engranajes

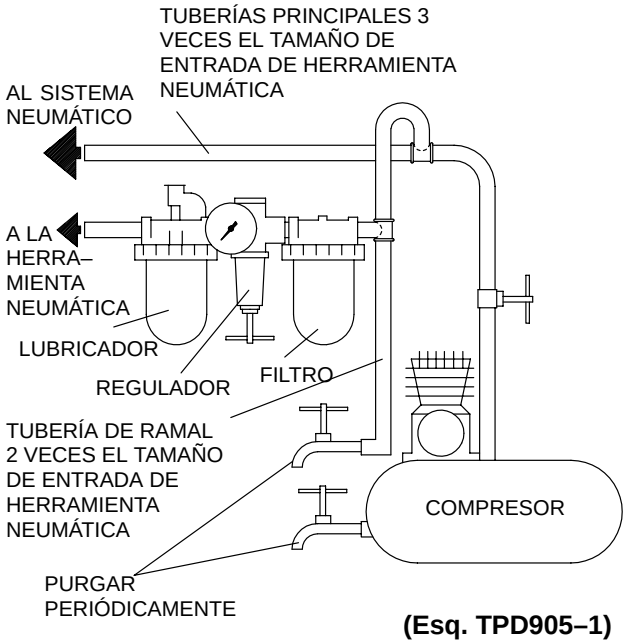
Para modelos de engranajes H, J, K o L, después de cada 50.000 ciclos o 160 horas de funcionamiento (lo que ocurra primero), inyecte aproximadamente 6 cc de grasa Ingersoll–Rand Nº 28 en el engrasador.

Para modelos de engranajes M o N, después de cada 50.000 ciclos o 160 horas de funcionamiento (lo que ocurra primero), inyecte aproximadamente 9 cc de grasa Ingersoll–Rand Nº 9 en el engrasador.

Cabeza angular

Para modelos con acoplamiento angular 7L1A1, 7L1A3, 7L1A4, 7L1B1 y 7L1B4, después de cada 8 horas de uso, inyecte 0,5 – 1,0 cc de grasa Ingersoll–Rand Nº 67 en el engrasador.

Para modelos con acoplamiento angular 7L2A4 o 7L3A4, después de cada 40 horas de funcionamiento, inyecte 0,5 – 1,0 cc de grasa Ingersoll–Rand Nº 67 en el engrasador (102).



(Esq. TPD905–1)

ESPECIFICACIONES

Modelo	Velocidad en vacío	Par de calado		Roscado hembra
	rpm	pulg.–lb	Nm	Husillo
7LH1A1	6.000	31	3,5	1/4–28
7LJ1A1	4.800	40	4,5	1/4–28
7LK1A1	3.200	57	6,4	1/4–28

Modelo	Velocidad en vacío	Par de calado		Capacidad del portabrocas	
	rpm	pulg.–lb	Nm	pulg.	mm
7LJ2A41	3.250	51	5,80	1/4	6
7LL3A42	1.550	105	11,87	3/8	10
7LM3A43	900	170	19,21	3/8	10
7LN3A44	600	255	28,82	1/2	12

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MANUAL DE FUNCIONAMENTO E MANUTENÇÃO
PERFURADORAS EM ÂNGULO
SÉRIES 7L

AVISO

As Perfuradoras em Ângulo 7L são concebidas para aplicações de perfuração em indústrias ligeiras, de equipamentos, electrônicas, aeroespaciais e de mobiliário. A Ingersoll–Rand não é responsável por modificações, feitas pelo cliente em ferramentas, nas quais a Ingersoll–Rand não tenha sido consultada.

⚠ ADVERTÊNCIA

INFORMAÇÃO DE SEGURANÇA IMPORTANTE EM ANEXO.
LEIA ESTE MANUAL ANTES DE OPERAR A FERRAMENTA.
É DA RESPONSABILIDADE DO EMPREGADOR COLOCAR A INFORMAÇÃO DESTE MANUAL NAS MÃOS DO OPERADOR.
O NÃO CUMPRIMENTO DAS SEGUINTES ADVERTÊNCIAS PODE RESULTAR EM FERIMENTOS.

COLOCANDO A FERRAMENTA EM FUNCIONAMENTO

- **Sempre opere, inspeccione e mantenha esta ferramenta de acordo com o Código de Segurança do Instituto Americano de Padrões Nacionais para Ferramentas Pneumáticas Portáteis (ANSI B186.1).**
- **Para segurança, máximo desempenho e máxima durabilidade das peças, opere esta ferramenta com uma pressão de ar máxima de 6,2 bar/620 kPa (90 psig) na entrada da mangueira de alimentação de ar com diâmetro interno de 10 mm (3/8”).**
- **Desligue sempre a alimentação de ar e desconecte a mangueira de alimentação de ar antes de instalar, remover ou ajustar qualquer acessório nesta ferramenta, ou antes de executar qualquer serviço de manutenção nesta ferramenta.**
- **Não use mangueiras de ar ou adaptadores danificados, gastos ou deteriorados.**
- **Certifique–se de que todas as mangueiras e adaptadores sejam do tamanho correcto e estejam apertados com firmeza. Veja o Desenho TPD905–1 para um arranjo típico de tubagem.**
- **Use sempre ar seco e limpo com pressão máxima de 90 psig. Pó, fumos corrosivos e/ou humidade excessiva podem arruinar o motor de uma ferramenta pneumática.**
- **Não lubrifique as ferramentas com líquidos inflamáveis ou voláteis tais como querosene, diesel ou combustível de jactos.**
- **Não remova nenhum rótulo. Reponha qualquer rótulo danificado.**

USANDO A FERRAMENTA

- **Use sempre óculos de protecção quando estiver operando ou executando serviço de manutenção nesta ferramenta.**
- **Use sempre protecção contra ruído ao operar esta ferramenta.**
- **Mantenha as mãos, partes do vestuário soltas e cabelos compridos afastados da extremidade em rotação.**
- **Antecipe e esteja alerta a mudanças repentinas no movimento quando ligar e operar qualquer ferramenta motorizada.**
- **Mantenha a posição do corpo equilibrada e firme. Não exagere quando operar esta ferramenta. Torques de reacção elevados podem ocorrer na ou abaixo da pressão de ar recomendada.**
- **Os acessórios da ferramenta podem continuar a emitir impactos brevemente após a pressão ter sido aliviada.**
- **Ferramentas accionadas pneumáticamente podem vibrar em uso. Vibração, movimentos repetitivos ou posições desconfortáveis podem ser prejudiciais às mãos e aos braços. Pare de usar a ferramenta caso ocorra algum desconforto, sensação de formigueiro ou dor. Procure assistência médica antes de retornar ao trabalho.**
- **Use acessórios recomendados pela Ingersoll–Rand.**
- **Quando quer que o Cabeçote em Ângulo seja instalado ou reposto, a Válvula Reguladora de Pressão deve ser posicionada de modo que um torque de reacção não tenderá a reter o curso na posição “LIGADA”.**
- **Esta Ferramenta não foi concebida para trabalhos em atmosferas explosivas.**
- **Esta Ferramenta não está isolada contra choques eléctricos.**

AVISO

O uso de peças de substituição que não sejam genuinamente da Ingersoll–Rand podem resultar em riscos de segurança, diminuição do desempenho da ferramenta, aumento da necessidade de manutenção e pode invalidar todas as garantias.

As reparações devem ser feitas somente por pessoal treinado autorizado. Consulte o Centro de Serviços da Ingersoll–Rand mais próximo.

Envie Todos os Comunicados Para o Distribuidor ou Escritório da Ingersoll–Rand Mais Próximo.

Impresso nos E.U.A.

Ingersoll-Rand®

IDENTIFICAÇÃO DO RÓTULO DE ADVERTÊNCIA

⚠ ADVERTÊNCIA

O NÃO CUMPRIMENTO DAS SEGUINTES ADVERTÊNCIAS PODE RESULTAR EM FERIMENTOS.

⚠ ADVERTÊNCIA

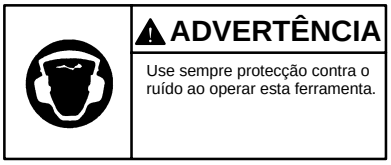
Use sempre óculos de protecção quando estiver operando ou executando algum serviço de manutenção nesta ferramenta.

⚠ ADVERTÊNCIA

Ferramentas accionadas pneumáticamente podem vibrar em uso. Vibração, movimentos repetitivos ou posições desconfortáveis podem ser prejudiciais às mãos e aos braços. Pare de usar a ferramenta caso ocorra algum desconforto, sensação de formigueiro ou dor . Procure assistência médica antes de retornar ao trabalho.

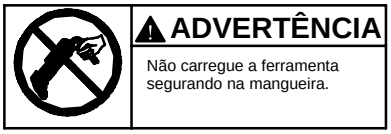
⚠ ADVERTÊNCIA

Mantenha a posição do corpo equilibrada e firme. Não exagere quando operar esta ferramenta. Torques de reacção elevados podem ocorrer sob a pressão de ar recomendada.



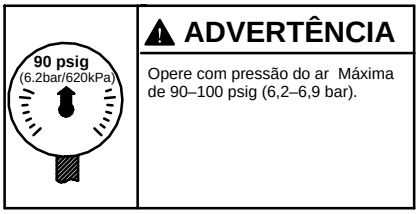
⚠ ADVERTÊNCIA

Use sempre protecção contra o ruído ao operar esta ferramenta.



⚠ ADVERTÊNCIA

Não carregue a ferramenta segurando na mangueira.

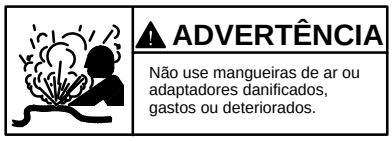


⚠ ADVERTÊNCIA

Opere com pressão do ar Máxima de 90–100 psig (6,2–6,9 bar).

⚠ ADVERTÊNCIA

Desligue sempre a alimentação de ar e desconecte a mangueira de alimentação de ar antes de instalar, remover ou ajustar qualquer acessório nesta ferramenta, ou antes de executar algum serviço de manutenção nesta ferramenta.



⚠ ADVERTÊNCIA

Não use mangueiras de ar ou adaptadores danificados, gastos ou deteriorados.

COLOCANDO A FERRAMENTA EM FUNCIONAMENTO

LUBRIFICAÇÃO

Ingersoll–Rand No. 10 **Ingersoll–Rand No. 28**
Ingersoll–Rand No. 67

Use sempre um lubrificador de linha com estas ferramentas. Nós recomendamos a seguinte Unidade Filtrador–Lubrificador–Regulador:

E.U.A.– No. C18–03–FKG0–28

Motor

Ante de operar a Ferramenta e depois de cada 8 horas de operação, a menos que um lubrificador de ar de linha estiver sendo usado, remova mangueira de ar e injecte umas poucas gotas de Óleo Ingersoll–Rand No. 10 na entrada de ar.

Engrenagem

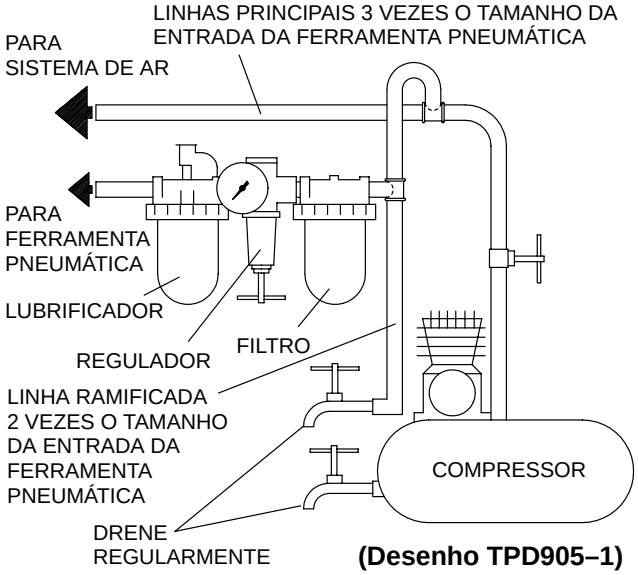
Para modelos com engrenagem H, J, K ou L, depois de cada 50.000 ciclos ou 160 horas de operação, o que ocorrer primeiro, injecte cerca de 6 cc de Masssa Lubrificante Ingersoll–Rand No 28 no Adaptador de Massa Lubrificante.

Para modelos com engrenagem M ou N, depois de cada 50.000 ciclos ou 160 horas de operação, o que ocorrer primeiro, injecte cerca de 9 cc de Massa Lubrificante Ingersoll–Rand No 28 no Adaptador de Massa Lubrificante.

Cabeçote em Ângulo

Para Modelos com Acoplamento em Ângulo 7LA1, 7L1A3, 7L1A4, 7L1B1 ou 7L1B4, depois de cada 8 horas de operação, injecte de 0,5 a 1,0 cc de Massa Lubrificante Ingersoll–Rand No. 67 no Adaptador de Massa Lubrificante.

Para Modelos com Acoplamento em Ângulo 7L2A4 ou 7L3A4, depois de cada 40 horas de operação, injecte de 0,5 a 1,0 cc de Massa Lubrificante Ingersoll–Rand No. 67 no Adaptador de Massa Lubrificante (102).

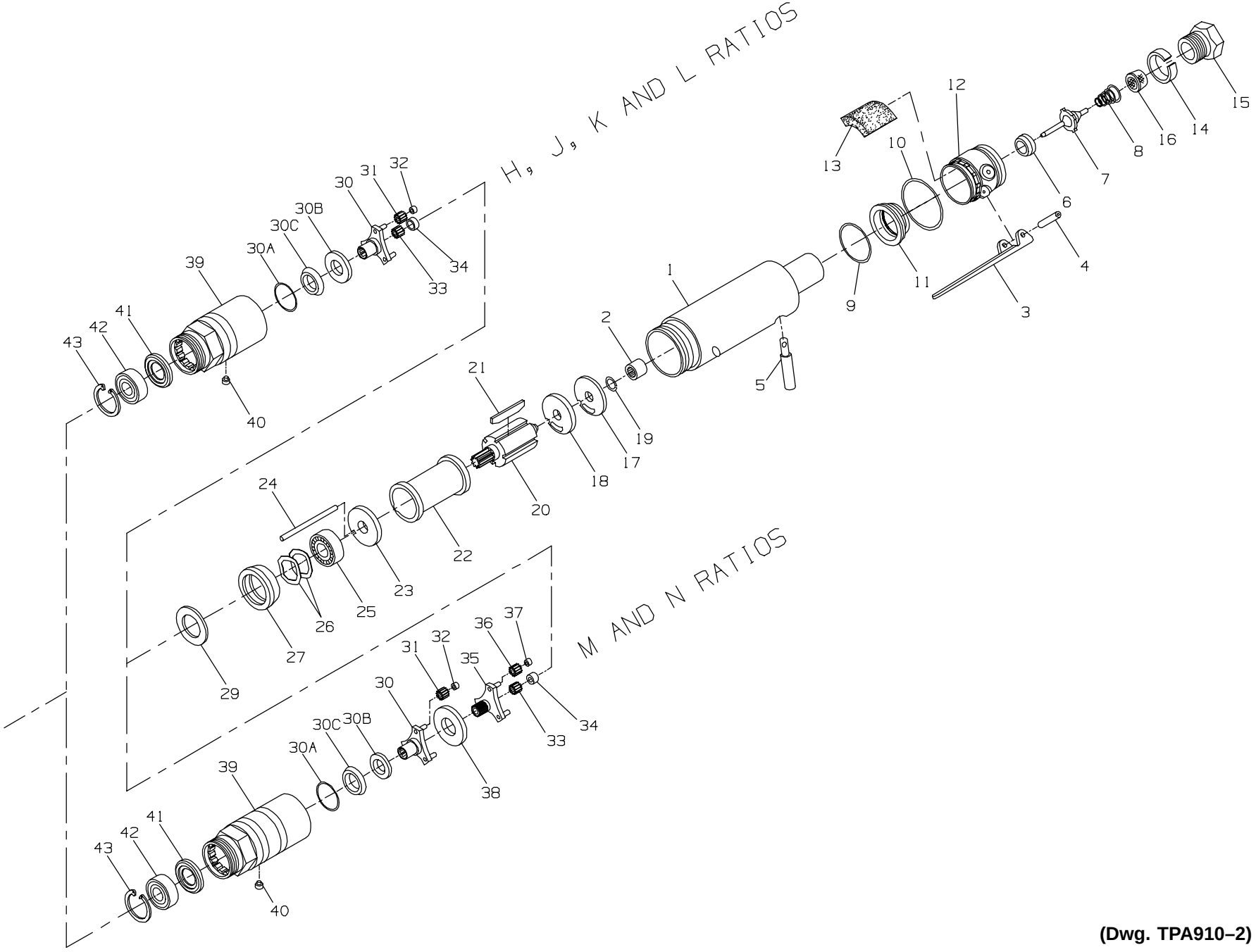


(Desenho TPD905–1)

ESPECIFICAÇÕES

Modelo	Velocidade Livre	Torque Maximo		Rosca Femea
	rpm	Nm	pol–lb.	Fuso
7LH1A1	6.000	3,5	31	1/4–28
7LJ1A1	4.800	4,5	40	1/4–28
7LK1A1	3.200	6,4	57	1/4–28

Modelo	Velocidade Livre	Torque Maximo		Capacidade do Encabadouro	
	rpm	Nm	pol–lb.	mm	pol.
7LJ2A41	3.250	5,80	51	6	1/4
7LL3A42	1.550	11,87	105	10	3/8
7LM3A43	900	19,21	170	10	3/8
7LN3A44	600	28,82	255	12	1/2


H, J, K AND L RATIOS
M AND N RATIOS
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(Dwg. TPA910–2)

PART NUMBER FOR ORDERING

		Motor Housing Assembly	
		for 7LJ1B1 and 7LK1B1	7LlB–A40
		for 7LJ1B1–EU and 7LK1B1–EU	7LlB–EU–A40
		for all others models ending in –EU	7L–EU–A40A
		for all others models	7L–A40A
	1	Motor Housing	
		for 7LJ1B1 and 7LK1B1	7L1B–B40
		for 7LJ1B1–EU and 7LK1B1–EU	7L1B–EU–B40
		for all others ending in –EU	7L–EU–B40A
		for all others models	7L–B40A
•	2	Rear Rotor Bearing	7L–24
	*	Warning Label	
		for models ending in –EU	EU–99
		for all others models	WARNING–7–99
	3	Throttle Lever	7L–273
	4	Throttle Lever Pin	7L–120
	5	Throttle Plunger	7L–94A
	6	Throttle Valve Seat	7AH–303
•	7	Throttle Valve	7AH–302
	8	Throttle Valve Spring	7L–51
	9	Silencer Seal Ring	WWV100A1–43
	10	Exhaust Deflector Seal	7A–379
	11	Exhaust Silencer	7L–310
	12	Exhaust Deflector	7L–23
•	13	Muffler Element	7L–311
	14	Inlet Bushing Spacer	7AH–65
	15	lnlet Bushing	7L–565
•	16	Air Strainer Screen	R0A2–61
	*	Locking Type Throttle Lever Assembly	
		for 7LH1A1	7LH1A1–A400
		for 7LJ1A1	7LJ1A1–A400
		for 7LK1A1	7LK1A1–A400
•	17	Rear End Plate Gasket	7AH–739
	18	Rear End Plate	
		for 7LJ1B1 and 7LK1B1	7RL–12
		for all others	7AH–12
•	19	End Plate Retainer	7AH–118
	20	Rotor	
		for H, J, L, M and N ratios	7AH–53
		for K ratio	7AK–53
•	21	Vane Packet (set of 4 Vanes)	7AH–42A–4
	22	Cylinder	7AH–3A
•	23	Front End Plate	7AH–11
	24	Cylinder Dowel	7AH–98
•	25	Front Rotor Bearing	R1–22
	26	Bearing Spring Washer (2)	7AH–278
	27	Front Rotor Bearing Housing	7AH–13
	29	Bearing Housing Spacer	7AH–81
	30	Spindle Assembly	
		for H ratio	7LH–8
		for J ratio	7LJ–A8
		for K and N ratios	7LK–A8
		for L ratio	7LL–A8
		for M ratio	7LM–A8
	30A	Spindle Seal (for K, L, M and N ratios)	182A53–610
	30B	Seal Retaining Washer (for J, K, L, M and N ratios)	7L–303
	30C	Seal Support (for J, K, L, M and N ratios)	5RAK–5

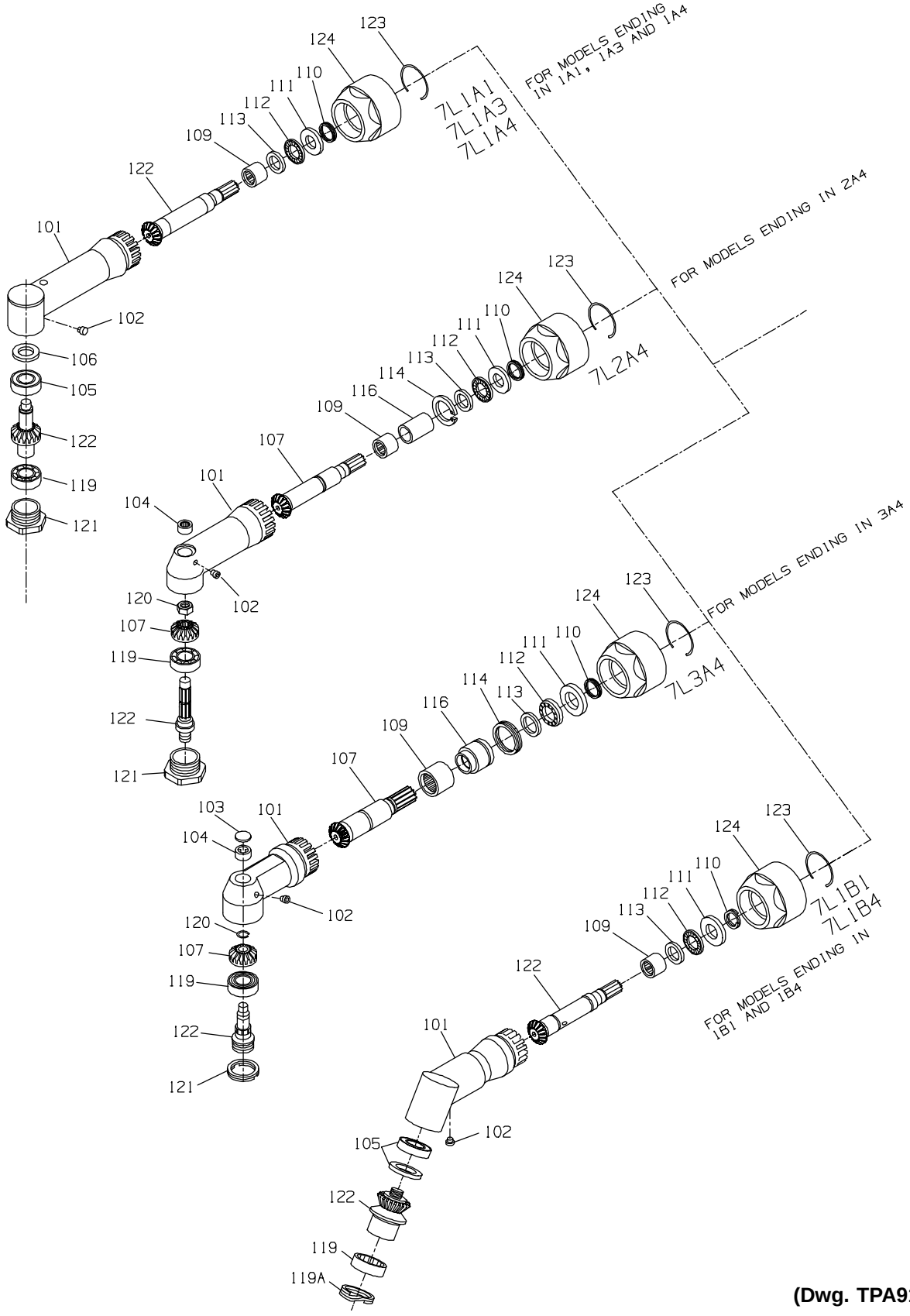
* Not illustrated.

• To keep downtime to a minimum, it is desirable to have on hand certain repair parts. We recommend that you stock one (pair or set) of each part indicated by a bullet (•) for every four tools in service.

		PART NUMBER FOR ORDERING			PART NUMBER FOR ORDERING
31	Spindle Planet Gear Assembly (3)		39	Gear Case	
	for H ratio (15 teeth)	7AH–A10		for H, J, K and L ratios	7LH–B37A
	for J and M ratios (18 teeth)	7AJ–A10		for M and N ratios	7LM–B37A
	for K and N ratios (21 teeth)	7AK–A10	40	Grease Fitting	D0F9–879
	for L ratio (22 teeth)	7AL–A10	41	Grease Shield	5R–701
32	Spindle Planet Gear Bearing		42	Spindle Bearing	R1L–24
	(1 for each Gear)		43	Spindle Bearing Retainer	7L–28
	for H ratio	7AH–500	*	Drill Chuck	
	for J and M ratios	7AJ–500		0 to 1/4” capacity	R0H–99
	for K, L and N ratios	7AK–500		0 to 5/16” capacity	6A–99
33	Rotor Pinion			0 to 3/8” capacity	R1M–99
	for H, M and N ratios (22 teeth)	7AH–17		5/64” to 1/2” capacity	R0K–99
	for J ratio (16 teeth)	7AJ–17	*	Drill Chuck Key	
34	Rotor Pinion Spacer (for H, J, M			for R0H–99	R1H–J253
	and N ratios)	7AH–18		for 6A–99	R0J–J253
35	Gear Head			for R1M–99	R1M–J253
	for M ratio (16 teeth)	7AM–216		for R0K–99	R1T–J253
	for N ratio (10 teeth)	7AN–216	*	Bevel Pinion Sprag Key (for 7L1Al, 7L1A3	
36	Gear Head Planet Gear Assembly			and 7L1B1 Angle Attachments)	5C1–416
	(for M and N ratios (15 teeth) (3)	7AH–A10	*	Suspension Bail	7L–365
37	Gear Head Planet Gear Bearing		*	Grease Gun	R000A2–228
	(1 for each Gear)	7AH–500	*	Spindle Bearing Cap Wrench	8SA32–26
38	Gear Head Spacer (for M or N ratio)	7AN–80	*	Tune–up Kit (includes illustrated parts: 2, 6,	
	Gear Case Assembly			7, 8, 9, 10, 13, 16, 17, 19, 21, 25 and 30A)	7L–DRILLS–TK1
	for H, J, K and L ratios	7LH–A37A	*	Piped–Away Exhaust Kit	7L–K284
	for M and N ratios	7LM–A37A			

* Not illustrated.

SERIES 7L ANGLEHEADS



(Dwg. TPA911–4)

PART NUMBER FOR ORDERING

		For Models ending in 1A1, 1A3 and 1A4	For Models ending in 1B1 and 1B4
	Angle Drill Attachment		
	for models ending in 1A1	7L1A1	———
	for models ending in 1A3	7L1A3	———
	for models ending in 1A4	7L1A4	———
	for models ending in 1B1	———	7L1B1
	for models ending in 1B4	———	7L1B4
101	Angle Housing Assembly	7L1A–B550	7L1B–A550
102	Grease Fitting	D0F9–879	D0F9–879
103	Angle Housing Cap	———	———
• 104	Spindle Upper Bearing	———	———
105	Spindle Upper Bearing	7L1A–603	7L1B–A97
• 106	Upper Bearing Shim Packet (two thicknesses of Shims)	7L1A–P448	———
• 107	Matched Bevel Gear Set (includes Bevel Pinion and Bevel Gear)	———	———
• 109	Bevel Pinion Bearing	7AH–24	7L1B–593
110	Bearing Seat Retainer	W22–6	W22–6
111	Rear Thrust Bearing Seat	7L2A–682	7L2A–682
112	Bevel Pinion Thrust Bearing	3RL2–105	3RL2–105
113	Front Thrust Bearing Seat	7L1A–683	7L1A–683
114	Pinion Bearing Spacer Retainer	———	———
116	Bevel Pinion Bearing Spacer	———	———
• 119	Lower Spindle Bearing	7L1A–593	7L1B–593
119A	Lower Spindle Bearing Retainer	———	7L1B–28
120	Bevel Gear Retainer	———	———
121	Spindle Bearing Cap	7L1A–531	———
• 122	Angle Drill Gear Set (includes Bevel Pinion and Bevel Gear/Spindle)		
	with 1/4–28 female thread (for models ending in 1A1)	7L1A1–A591	———
	with 1/4–28 female thread (for models ending in 1B1)	———	7L1B1–A591
	with 5/16–24 female thread (for models ending in 1A3)	7L1A3–A591	———
	with 9/32–40 male thread (for models ending in 1A4)	7L1A4–A591	———
	with 9/32–40 female thread (for models ending in 1B4)	———	7L1B4–A591
123	Coupling Nut Retainer	5C1–29	5C1–29
124	Coupling Nut	7L–27	7L–27
*	Bearing Inserting Tool	7L1A–950	7L1B1–955

* Not illustrated.

• To keep downtime to a minimum, it is desirable to have on hand certain repair parts. We recommend that you stock one (pair or set) of each part indicated by a bullet (•) for every four tools in service.

PART NUMBER FOR ORDERING

			For Models ending in 2A4	For Models ending in 3A4
		Angle Drill Attachment	7L2A4	7L3A4
	101	Angle Housing Assembly	7L2A–B550	7L3A–B550
	102	Grease Fitting	D0F9–879	D0F9–879
	103	Angle Housing Cap	———	8SA32–110
•	104	Spindle Upper Bearing	120A4–603	8SA32–603
	105	Spindle Upper Bearing	———	———
•	106	Upper Bearing Shim Packet (two thicknesses of Shims)	———	———
•	107	Matched Bevel Gear Set (includes Bevel Pinion and Bevel Gear)	141A12–A552	7L3A–A552
•	109	Bevel Pinion Bearing	H54U–511B	182A53–606
	110	Bearing Seat Retainer	1415A12–6	1415A12–6
	111	Rear Thrust Bearing Seat	7L2A–682	7L2A–682
	112	Bevel Pinion Thrust Bearing	161A32–105	161A32–105
	113	Front Thrust Bearing Seat	141A12–683	141A12–683
	114	Pinion Bearing Spacer Retainer	RXA21–343	182A53–685
	116	Bevel Pinion Bearing Spacer	7L2A–165	182A53–165
•	119	Lower Spindle Bearing	120A4–593	8SA32–593
	119A	Lower Spindle Bearing Retainer	———	———
	120	Bevel Gear Retainer	120A4–578	8SA32–578
	121	Spindle Bearing Cap	7L2A4–531	8SA32–531
•	122	Angle Drill Gear Set (includes Bevel Pinion and Bevel Gear/Spindle)		
#		with 3/8–24 male thread	7L2A4–791	7L3A4–791
		with 9/32–40 female thread	———	———
	123	Coupling Nut Retainer	5C1–29	5C1–29
	124	Coupling Nut	7L–27	7L–27
	*	Bearing Inserting Tool	7L2A–950	7L3A–950

* Not illustrated.

• To keep downtime to a minimum, it is desirable to have on hand certain repair parts. We recommend that you stock one (pair or set) of each part indicated by a bullet (•) for every four tools in service.

\# Does not include Bevel Gear Set. For Bevel Gear Set, order illustration number 107.

MAINTENANCE SECTION

⚠ WARNING

Always wear eye protection when operating or performing maintenance on this tool.

Always turn off air supply and disconnect air supply hose before installing, removing or adjusting any accessory on this tool, or before performing any maintenance on this tool.

LUBRICATION

Each time the Series 7L Angle Drills are disassembled for maintenance, repair or replacement of parts, lubricate the tool as follows:

1. **Motor**
   Use Ingersoll–Rand No. 10 Oil for lubricating the motor. Inject a few drops of oil into the air inlet before attaching the air hose.
2. **Gearing**
   For models with H, J, K or L gearing, inject approximately 6 cc of Ingersoll–Rand No. 28 Grease into the Grease Fitting (40).
   For models with M or N gearing, inject approximately 9 cc of Ingersoll–Rand No. 28 Grease into the Grease Fitting (40).
3. **Angle Head**
   For models with 7L1A1, 7L1A3, 7L1A4, 7L1B1 and 7L1B4 Angle Attachment, after each 8 hours of operation, inject 0.5 – 1.0 cc of Ingersoll–Rand No. 67 Grease into Grease Fitting (102).
   For models with 7L2A4 or 7L3A4 Angle Attachment, after each 40 hours of operation, inject 0.5 – 1.0 cc of Ingersoll–Rand No. 67 Grease into Grease Fitting (102).

DISASSEMBLY

General Instructions

1. Do not disassemble the tool any further than necessary to replace or repair damaged parts.
2. Whenever grasping a tool or part in a vise, always use leather–covered or copper–covered vise jaws to protect the surface of the part and help prevent distortion. This is particularly true of threaded members and housings.
3. Do not remove any part which is a press fit in or on a subassembly unless the removal of that part is necessary for repairs or replacement.
4. Do not disassemble the tool unless you have a complete set of new gaskets and O–rings for replacement.

Disassembly of the Angle Attachment

1. Remove the Drill Chuck by inserting the Chuck Key in one of the holes in the Chuck and rapping the Key sharply with a hammer.
2. Carefully grasp the flats of the Coupling Nut (124) in leather–covered or copper–covered vise jaws, Angle Head (101) facing down.

   NOTICE

   The Gear Case (39) has left–hand threads.
3. Using a wrench on the flats of the Gear Case, loosen the Gear Case from the Coupling Nut.

   NOTICE

   Remove the tool from the vise. Unscrew and remove the Coupling Nut from the Gear Case.
4. Carefully grasp the Angle Head (101) in leather–covered or copper–covered vise jaws, Spindle (122) facing upward.

   NOTICE

   The Spindle Bearing Cap (121) has left–hand threads.

   NOTICE

   Do not remove the Spindle from the Angle Head until the Bevel Pinion (122) is pulled outward against the Bevel Pinion Bearing (109). Failure to do so could damage the Spindle Upper Bearing (105), the Bearing will not be removable from the Spindle, or the Bevel Pinion will be damaged. If tightness or binding occurs. Check to make sure the Bevel Pinion as been pulled outward.
5. **For 7L1A1 or 7L1A3 Angle Head,** using a wrench, remove the Spindle Bearing Cap.

   NOTICE

   The Spindle Bearing Cap has left–hand threads.

   For 7L2A4 Angle Head, use a wrench to remove the Spindle Bearing Cap. Withdraw the Spindle from the Angle Head.

   NOTICE

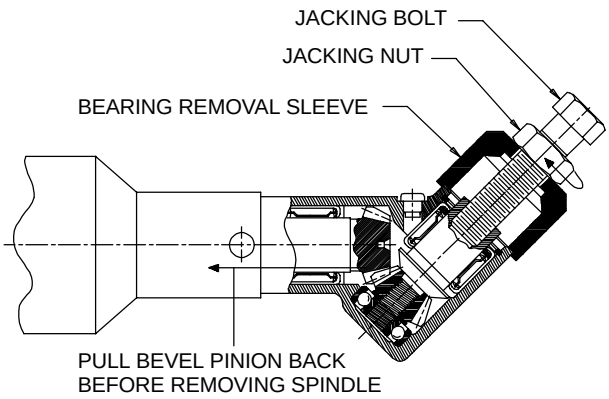
   The Spindle Bearing Cap has left–hand threads.

   For 7L3A4 Angle Head, use No. 8SA32–26 Bearing Cap Wrench to remove the Spindle Bearing Cap Withdraw the Spindle from the Angle Head.

For 7L1B1 Angle Head, use a thin blade screwdriver to pry out and under the tab of the Lower Spindle Bearing Retainer (119A). Rotate the screwdriver around the Spindle to spiral the retainer out of its groove.

NOTICE

Do not remove the Spindle from the Angle Head until the Bevel Pinion (108) is pulled outward against the Bevel Pinion Bearing (109). Do not remove the Spindle unless a new Lower Spindle Bearing (119) is available for installation. This type of bearing is always damaged during removal and the bearing must be removed with the Spindle. Each 7L1B1–955 Bearing Inserting Tool includes tooling to remove the Spindle and Lower Spindle Bearing from the 7L1B1 Angle Head. See Dwg. TPD792.



(Dwg. TPD792)

Install the Jacking Nut on the Jacking Bolt near the head of the Bolt. Position the Bearing Removal Sleeve on the face of the Angle Head with the large open end toward the Spindle. With the Angle Head nested in the shallow counterbore of the Sleeve, screw the Jacking Bolt into the Spindle through the Sleeve. While keeping the Jacking Bolt stationary with a wrench on the head of the Bolt, use another wrench to rotate the Jacking Nut clockwise pulling the Spindle, Lower Spindle Bearing and Spindle Upper Bearing (105) from the Angle Head.

6. Inspect the Lower Spindle Bearing for looseness or roughness. If either of these conditions exists, replace the bearing as follows:
   a. **For 7L1A1, 7L1A3 or 7L1B1 Angle Head,** slip the Lower Spindle Bearing from the Spindle.
   b. **For 7L2A4 Angle Head,** grasp the threaded end of the Spindle in leather–covered or copper–covered vise jaws.
   c. Unscrew the Bevel Gear Retainer (120) and lift off the Bevel Gear (107).
   d. Press the Spindle from the Lower Spindle Bearing.
   e. **For 7L3A4 Angle Head,** remove the Bevel Gear Retainer.
   f. Press off the Bevel Gear. Press the Spindle from the Lower Spindle Bearing.

NOTICE

Do not remove the Spindle Upper Bearing unless you have have a new bearing ready to install. This type of bearing is always damaged during the removal process.

NOTICE

7L3A4 Angle Head will require a new Angle Housing Cap (103) when the Spindle Upper Bearing is installed.

7. **For 7L1A1, 7L1A3 or 7L1B1 Angle Head,** if the Spindle Upper Bearing appears rough or loose, press or pull it off the Spindle.
   For 7L2A4 or 7L3A4 Angle Head, if the Spindle Upper Bearing (104) appears rough or loose, press it from the Angle Head.
8. Remove the Bearing Seat Retainer (110) and slide off the Rear Thrust Bearing Seat (111), Bevel Pinion Thrust Bearing (112) and Front Thrust Bearing Seat (113) from the pinion shaft.
9. **For 7L2A4 Angle Head,** use snap ring pliers to remove the Pinion Bearing Spacer Retainer (114). Remove the Bevel Pinion Bearing Spacer (116).
10. **For 7L3A4 Angle Head,** use a thin blade screwdriver to pry out and under the tab of the Pinion Bearing Spacer Retainer. Rotate the screwdriver around the pinion shaft to spiral the retainer out of its groove. Using a hooked tool, reach into the Bevel Pinion Bearing Spacer (116) and hook the drilled cross–hole in the Spacer. Pull the Spacer from the Angle Head. Remove the Rear Seal (117) and Front Seal (118).

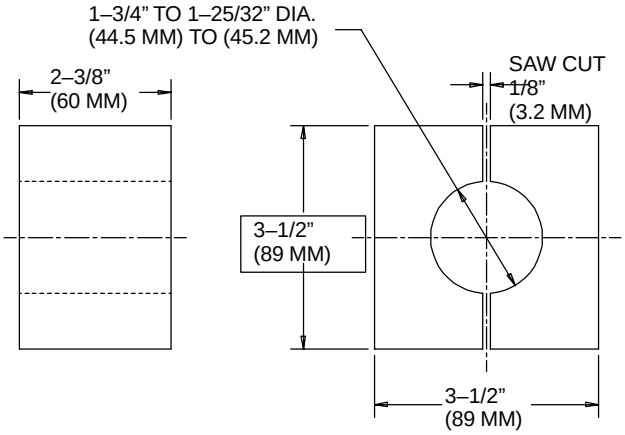
NOTICE

Do not remove the pinion shaft and bearing unless you have a new bearing on hand. After the Angle Head is disassembled, check all parts for damage or wear.

11. Grasp the spline of the pinion shaft in leather–covered or copper–covered vise jaws and gently tap the rear face of the Angle Head with a soft hammer to pull the Bevel Pinion Bearing.

Disassembly of Gearing

1. Using a pin punch and hammer, drive out the Throttle Lever Pin (4) to release the Throttle Lever (3).
2. Make a set of hardwood Blocks. See Dwg. TPD681.



(Dwg. TPD681)

3. Place the hardwood blocks around the Motor Housing (1).
4. With the Motor Housing in a vertical position and Gear Case (39) upward, securely clamp the blocks in a vise taking care not to distort the Motor Housing.

NOTICE

This Gear Case has left–hand threads.

5. Using a wrench on the flats of the Gear Case, loosen, but do not remove, the Gear Case.

NOTICE

Be certain to hold the Angle Drill over the workbench so that you will not lose any parts.

6. Remove the tool from the vise and, while holding the Angle Drill horizontally, carefully unscrew the Gear Case by hand and pull it away from the Motor Housing.
7. If the Bearing Housing Spacer (29) remained in the Gear Case (39), remove it from the Gear Case.
8. **For H, J, M or N ratio,** the Rotor Pinion (33) and Rotor Pinion Spacer (34) may come out with the Spindle, or they may have remained with the Rotor (20) when the Gear Case was removed. Remove the Rotor Pinion and Rotor Pinion Spacer.
9. **For H, J, K or L ratio,** remove the Spindle Planet Gears (31). Position the Gear Case vertically in an arbor press, planet gear end down. Using a brass rod and contacting the end of the Spindle, press the Spindle from the Gear Case.

   For M or N ratio, remove the Planet Gears (36), Gear Head (35), Gear Head Spacer (33) and Spindle Planet Gears (3l). Position the Gear Case vertically in an arbor press, Planet Gear end down. Using a brass rod and contacting the end of the Spindle, press the Spindle from the Gear Case.
10. Using snap ring pliers, remove the Spindle Bearing Retainer (43).
11. Remove the Spindle Bearing (42) from the Gear Case.
12. Withdraw the Grease Shield (41) from the Gear Case.

Disassembly of Motor and Throttle

1. If the Bearing Housing Spacer (29) remained with the Front Rotor Bearing Housing, remove it from the Housing.
2. Remove the Front Rotor Bearing Housing (27) and the two Bearing Spring Washers (26).
3. Grasp the splined end of the Rotor (20) and pull the assembled motor from the Motor Housing (1).
4. Remove the Rear End Plate Gasket (17) from the Motor Housing.

NOTICE

Make certain the End Plate Retainer (19) does not fly when it is slipped off the hub of the Rotor.

5. Using a pair of external snap–ring pliers with just the tips of the pliers inserted between the ends of the End Plate Retainer (19), spread the Retainer enough to remove it from the groove in the hub of the Rotor.
6. Remove the Rear End Plate (18), Cylinder (22) and Vanes (21).

NOTICE

Do not remove the Rear Rotor Bearing (2) unless you have a new bearing on hand for replacement. The old bearing will be damaged during the removal process.

7. Check the Front Rotor Bearing (23) for wear or roughness. If replacement is necessary, support the Front End Plate (23) between two blocks of wood on the table of an arbor press. Press the Rotor from the Front Rotor Bearing.
8. To remove the Rear Rotor Bearing, refer to step 15.
9. Using hardwood blocks placed around the Motor Housing (see Dwg. TPD681), clamp the blocks in a vise, positioning the handle so the inlet is upward.
10. Using a wrench on the flats, unscrew and remove the Inlet Bushing (15).

11. Remove the Throttle Valve Spring (8) and Air Strainer Screen (16).
12. Remove the Exhaust Deflector (12), Inlet Bushing Spacer (14), Exhaust Silencer (11), Muffler Element (13), Exhaust Deflector Seal (10) and Silencer Seal Ring (9).
13. Lift out the Throttle Valve (7) and the Throttle Plunger (5).

NOTICE

The Throttle Valve Seat (6) is reversible. Mark the side of the Throttle Valve Seat so the side that faced up toward the inlet will be the underside on reinstallation.

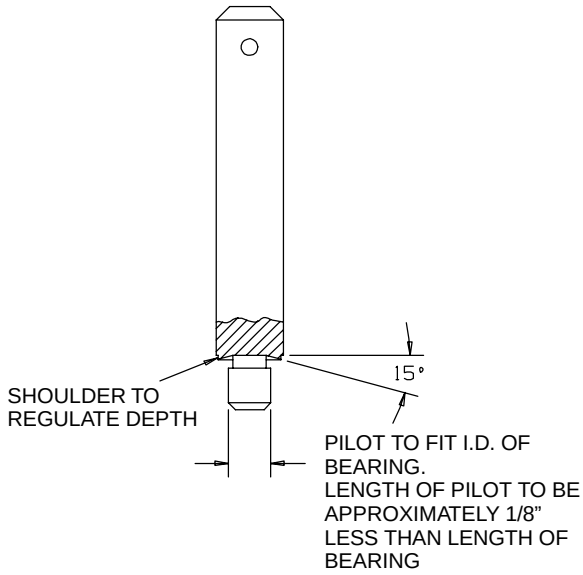
14. If removal of the Throttle Valve Seat is necessary, use a hooked tool to pull the Seat from the Housing.
15. To remove the Rear Rotor Bearing, proceed as follows:
    a. Insert a 1/4" (6 mm) diameter by 6" (152 mm) long, flat faced steel rod into the air inlet until it contacts the Rear Rotor Bearing.
    b. Press the end of the steel rod to remove the Rear Rotor Bearing out of the front end of the Motor Housing.

ASSEMBLY

General Instructions

1. Always press on the **inner** ring of a ball–type bearing when installing the bearing on a shaft.
2. Always press on the **outer** ring of a ball–type bearing when pressing the bearing into a bearing recess.
3. Whenever grasping a tool or part in a vise, always use leather–covered or copper–covered vise jaws. Take extra care with threaded parts and housings.
4. Always clean every part and wipe every part with a thin film of oil before installation.
5. Check every bearing for roughness. If an open bearing must be cleaned, wash it thoroughly in a clean, suitable, cleaning solution and dry with a clean cloth. **Sealed or shielded bearing should never be cleaned.** Work grease thoroughly into every open bearing before installation.
6. Apply a film of O–ring lubricant to all O–rings before final assembly.
7. Unless otherwise noted, always press on the stamped end of a needle bearing when installing the needle bearing in a recess. Use a bearing inserting tool similar to the one in Dwg. TPD786.

Needle Bearing Inserting Tool



(Dwg. TPD786)

Assembly of Motor and Throttle

1. If the Rear Rotor Bearing (2) was removed, install a new one as follows:
    a. Using a bearing inserting tool (See Dwg. TPD786) that has a pilot extending into the Bearing, and a shoulder that contacts the outer radius on the bearing shell, press the Rotor Bearing, closed end first, into the bearing recess of the Motor Housing (1) until it is about .010" (0.25 mm) below flush.
    b. Inject 0.5 cc of grease into the Bearing.
2. Using hardwood blocks placed around the Motor Housing (See Dwg. TPD681), clamp the blocks in a vise, positioning the handle so the inlet is upward.

NOTICE

Make sure the reverse side of the Throttle Valve Seat (6) when disassembling now becomes the side facing the inlet.

3. If the Throttle Valve Seat was removed, use a flat–faced rod 1/2" (13 mm) in diameter by 3" (75 mm) long to press the Throttle Valve Seat into the handle until it seats.
4. Install the Throttle Valve Plunger (5) until the hole in the Plunger aligns dead center with the hole in the Throttle Valve Seat.
5. Using needle nose pliers to hold the short–stem end of the Throttle Valve (7), install the Valve long–stem end through the hole in the Throttle Valve Seat and the Throttle Valve Plunger.

6. Install the Muffler Element (13) by wrapping it horseshoe fashion around the inside of the Exhaust Deflector (12).
7. Snap the Exhaust Silencer (11) into the large open end of the Exhaust Deflector.
8. Install the Exhaust Deflector Seal (10) into the groove on the front end of the Exhaust Deflector.
9. Install the Silencer Seal Ring (9) over the hub of the Motor Housing and flush with the base of the hub.

NOTICE

Tabs on the Exhaust Deflector and notches in the Motor Housing are designed so they can only be mated correctly.

10. Install the Exhaust Deflector over the hub of the Motor Housing, aligning the tabs on the Exhaust Deflector with the notches in the Motor Housing.
11. Insert the Air Strainer Screen (16), closed end first, inside the external threaded end of the Inlet Bushing (15).
12. Insert the Throttle Valve Spring (8), large coil end first, into the Inlet Bushing making sure it is flush with the Air Strainer Screen.
13. Install the Inlet Bushing Spacer (14) over the threaded end of the Inlet Bushing.
14. Thread the Inlet Bushing into the Motor Housing, making certain the Throttle Valve Spring encircles the short–stem end of the Throttle Valve. Tighten the Inlet Bushing to a minimum of 25 ft–lb (33.9 Nm) torque.

NOTICE

The throttle lever pin hole is stepped on the left side of the Exhaust Deflector, when facing the air inlet end of the tool, for ease of installation of the Throttle Level Pin (4). Operate the Lever to check for free movement.

15. Install the Throttle Lever (3) from left to right using the Throttle Lever Pin.
16. Slide the Front End Plate (23), flat side first, over the splined end of the Rotor (20).
17. Using a sleeve that contacts only the inner ring of the Front Rotor Bearing (25), press the Front Rotor Bearing onto the splined hub of the Rotor until it seats against the Front End Plate.
18. The clearance between the Front End Plate and the Rotor is critical. While holding the Front End Plate, gently tap the splined end of the Rotor until you can insert a 0.001" feeler gauge or shim between the face of the Rotor and End Plate.
19. Grasp the splined end of the Rotor in copper–covered vise jaws so the short hub of the Rotor is upward.
20. Wipe each Vane (21) with a film of the recommended oil and place a Vane in each slot in the Rotor.
21. **For 7LJ1B1 or 7LK1B1,** place the Cylinder (22) down over the Rotor and against the Front End Plate with the end of the Cylinder having the large bevel at the rear of the shoulder trailing.
    For all others, place the Cylinder down over the Rotor and against the Front End Plate with the end of the Cylinder having the straight face at the rear of the shoulder trailing.
22. Place the Rear End Plate (18), flat side first, over the short hub of the Rotor.

NOTICE

Make certain the End Plate Retainer (19) does not fly as you slip it on the hub of the Rotor.

23. Install the End Plate Retainer in the groove on the rotor hub.
24. Position the Rear End Plate Gasket (17) into the bottom of the Motor Housing bore so the dowel hole and air inlet port in the Gasket align with the dowel hole and air inlet in the housing bore face.
25. Using an assembly dowel 3/32" in diameter by 10" long (2.3 mm x 254 mm), align the dowel groove in the Front End Plate, Cylinder, and Rear End Plate. Place the assembly rod in the aligned grooves so that about 3" (75 mm) of the rod extends beyond the Rear End Plate. Insert the extension into the dowel hole at the bottom of the housing bore, and slide the motor into the Motor Housing until it seats.
26. Withdraw the assembly dowel and insert the Cylinder Dowel (24) until the Cylinder Dowel is slightly below the surface of the Front End Plate.
27. Place the two Bearing Spring Washers (26) inside the Front Rotor Bearing Housing (27) and against the Front Rotor Bearing Retainer.
28. Slide the Front Rotor Bearing Housing over the Front Rotor Bearing.

Assembly of Gearing

1. Install the Grease Shield (41) into the front end of the Gear Case (39) until it seats in the recess.
2. Slip the Spindle Bearing (42) into the Gear Case until it seats and is flush against the Grease Shield.
3. Using snap ring pliers, install the Spindle Bearing Retainer (43) in the groove in front of the Spindle Bearing.
4. If the Spindle Planet Gear Bearings (32) were removed, press in new Spindle Planet Gear Bearings using a bearing inserting tool (See Dwg. TPD786) that has a pilot and that contacts the outer radius of the Bearing. Press against the stamped end of the Bearing.

For J or M ratio, press the new Spindle Planet Gear Bearings into the Spindle Planet Gear to a depth of 0.02" to 0.03" (0.50 mm to 0.75 mm) from the face of the Spindle Planet Gear.

5. **For H, J, K or L ratio,** proceed as follows:
   a. While supporting the inner race of the Spindle Bearing in an arbor press, external threads of the Gear Case facing downward, press the Spindle (30) into the Spindle Bearing until the shoulder of the Spindle is seated against the Bearing.
   b. Place a Spindle Planet Gear (31) on each gear shaft of the Spindle.
   c. Work 3 cc to 6 cc of the recommended grease into the gear train.
6. **For M or N ratio,** proceed as follows:
   a. While supporting the inner race of the Spindle Bearing in an arbor press, external threads of the Gear Case facing downward, press the Spindle into the Spindle Bearing until the shoulder of the Spindle it seated against the Bearing.
   b. Place a Spindle Planet Gear on each gear shaft of the Spindle.
   c. If the Gear Head Planet Gear Bearings (37) were removed, press in new Gear Head Planet Gear Bearings using a bearing inserting tool (See Dwg. TPD786) that has a pilot and that contacts the outer radius of the Bearing. Press against the stamped end of the Bearing.
   d. Install the Gear Head Spacer (38) into Gear Case flush against the face of the Spindle Planet Gears.
   e. Install the assembled Gear Head (35) into the Gear Case, entering the spline of the Gear Head into mesh with the Spindle Planet Gears.
7. Insert the Bearing Housing Spacer (29) into the Gear Case.
8. **For H, J, M or N ratio,** place the Rotor Pinion Spacer (34) and Rotor Pinion (33) over the splined end of the Rotor.

NOTICE

The Gear Case has left–hand threads.

NOTICE

Run the motor at free speed while tightening the Gear Case. Listen to make sure there is no scoring.

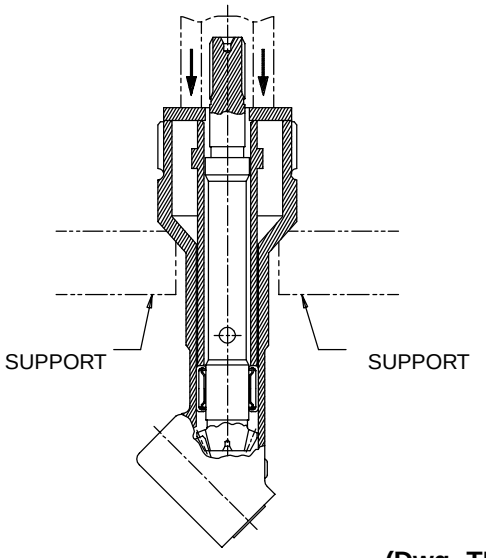
9. Thread the assembled Gear Case onto the Motor Housing and tighten it to 40 ft–lb (54.1 Nm) torque.

Assembly of Angle Attachment

NOTICE

For 7L1A1, 7L1A3, 7L1A4, 7L1B1 and 7L1B4, the Bevel Pinion (122) and the Bevel Gear/Spindle (122) are specially matched. Replace these parts only as a matched set.
For 7L2A4 and 7L3A4, the Bevel Pinion (107) and Bevel Gear (107) are specially matched. Replace these parts only as a matched set.

1. Lubricate the Bevel Pinion (107 or 122) as instructed on Page 2 and insert it, gear end first, into the long bore of the Angle Head (101).
2. Lubricate the Bevel Pinion Bearing (109) as instructed on Page 2 and insert it, unstamped end first, into the bore of the Angle Head, after the Bevel Pinion.
3. **For 7L1A1 or 7L1A3 Angle Head,** use No. 7L1A–950 Bearing Inserting Tool and press the Bevel Pinion Bearing so the stamped face is a maximum of 2.40" (61 mm) but not less than 2.38" (60.5 mm) below the end face of the Angle Head.
   For 7L2A4 Angle Head, use No. 7L2A–950 Bearing Inserting Tool and press the Bevel Pinion Bearing so the stamped face is a maximum of 1.65" (42.0 mm) but not less than 1.64" (41.75 mm) below the end face of the Angle Head.
   For 7L3A4 Angle Head, use No. 7L3A–950 Bearing Inserting Tool and press the Bevel Pinion Bearing so the stamped face is a maximum of 1.35" (34.4 mm) but not less than 1.34" (34.1 mm) below the end face of the Angle Head.
   For 7L1B1 Angle Head, use the long Bearing Inserting Sleeve included in the 7L1B1–955 Bearing Inserting Tool package and press the Bevel Pinion Bearing so the stamped face is a maximum of 2.12" (54 mm) but not less than 2.11" (53.5 mm) below the end face of the Angle Head. See Dwg. TPD793.



(Dwg. TPD793)

4. **For 7L2A4 Angle Head,** install the Bevel Pinion Bearing Spacer (116). Using snap ring pliers, install the Pinion Bearing Spacer Retainer (114).
   For 7L3A4 Angle Head, install the Front Seal (118) and Rear Seal (117) into their respective grooves on the Bevel Pinion Bearing Spacer (116). Insert the Spacer Assembly over the splined end of the Bevel Pinion and into the Angle Head until it is beyond the Spacer Retainer groove. Using a thin blade screwdriver, start the end of the Pinion Bearing Spacer Retainer (114) opposite the tab end into the groove of the Angle Head. Rotate the screwdriver around the pinion shaft to spiral the Retainer into the groove.

NOTICE

Check to make sure the Retainer is completely seated.

5. Lubricate the Bevel Pinion Thrust Bearing (112) as instructed on Page 2. Install in order named the Front Thrust Bearing Seat (113), Bevel Pinion Thrust Bearing (112) and Rear Thrust Bearing Seat (111) over the splined end of the Bevel Pinion and retain with the Bearing Seat Retainer (110).
6. If the Lower Spindle Bearing (119) has been removed, proceed as follows:
   a. **For 7L2A4 Angle Head,** using a sleeve that will contact only the inner ring of the Bearing, press the Lower Spindle Bearing, sealed side first, onto the Spindle (122).
   b. **For 7L3A4 Angle Head,** using a sleeve that will contact only the inner ring of the Bearing, press on the stamped face of the Bearing, red side toward the shoulder on the Spindle.
7. **For 7L2A4 Angle Head,** slide the Bevel Gear (107) onto the Spindle.
   For 7L3A4 Angle Head, press the Bevel Gear (107) onto the Spindle.
8. **For 7L2A4 Angle Head,** apply a thread–locking compound to the thread on the Bevel Gear Retainer Nut (120) and tighten it on the Spindle to 10 ft–lb (13.5 Nm) torque.
   For 7L3A4 Angle Head, spread the Bevel Gear Retainer (107) and slip it over the end of the Spindle. Slide the Retainer down the Spindle and into the groove of the Spindle to retain the Bevel Gear.
9. If the Spindle Upper Bearing (104 or 105) was removed, install a new Bearing as follows:

CAUTION

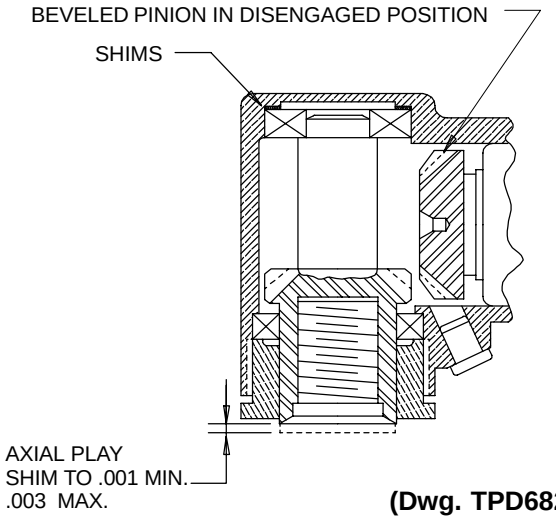
Do not get any Loctite in the bearing; damage to the bearing could result.

   a. **For 7L1A1 or 7L1A3 Angle Head,** apply a small drop of thread–locking compound to the small outside diameter of the Upper Spindle Bearing Shaft.
   b. Press the Spindle Upper Bearing (105) onto the Spindle (122) and allow the thread–locking compound to dry for a minimum of 10 minutes.

NOTICE

Make sure the Bevel Pinion (122) is pulled outward toward the Bevel Pinion Bearing before inserting the Spindle into the Angle Head.

   c. Insert the Spindle into the Angle Head until the Upper Spindle Bearing seats into the recess of the Angle Head.
   d. Slip the Lower Spindle Bearing over the end of the Spindle and into the Angle Head recess.
   e. Install the Spindle Bearing Cap (121) finger–tight.
   f. Spindle must turn freely.
   g. With the Bevel Gear out of mesh with the Bevel Pinion, measure the axial play of the Spindle (use + 0.25 lb loads). Subtract 0.002" (0.051 mm) from the reading for required shim thickness. See Dwg. TPD682–1.



(Dwg. TPD682–1)

h. Unscrew and remove the Spindle Bearing Cap. While pulling the Bevel Pinion outward toward the Bevel Pinion Bearing (109). Remove the Spindle from the Angle Head.

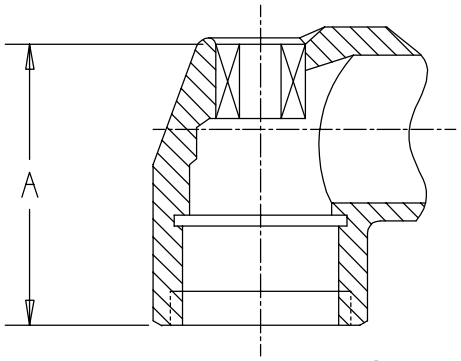
NOTICE

The Shim Packet contains three 0.002" (0.05 mm) shims and two 0.005" (0.13 mm) shims.

i. Insert the required number of shims, as determined from step (g), into the upper bearing recess of the Angle Head.

j. Reassemble and test the Angle Head as indicated in steps (c) through (f).

k. **For 7L2A4 Angle Head,** press on the closed end of a new Spindle Bearing entering the Bearing into the small bore opposite the threaded end of the Angle Head to the dimension shown. See Dwg. TPD680.



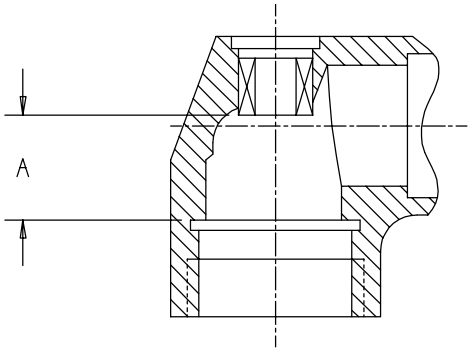
(Dwg. TPD680)

Minimum Dimension		Maximum Dimension	
"A"		"A"	
in	mm	in	mm
1.21	30.75	1.27	31.25

CAUTION

Press on the stamped face of the Bearing. Failure to do so will cause damage to the Bearing. Install a new Angle Housing Cap (103) into the top of the Angle Head.

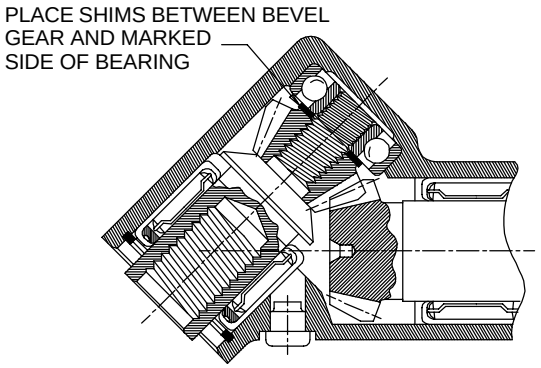
l. **For 7L3A4 Angle Head,** press a new Spindle Bearing into the Angle Head from the large threaded end to the dimension shown. See Dwg. TPD636.



(Dwg. TPD636)

Minimum Dimension		Maximum Dimension	
"A"		"A"	
in	mm	in	mm
0.718	18.25	0.728	18.50

m. **For 7L1B1 Angle Head,** install all the shims provided with each Spindle Upper Bearing on the Spindle against the Bevel Gear. See Dwg.TPD787.



(Dwg. TPD787)

CAUTION

Do not get any thread–locking compound in the bearing; damage to the bearing could result.

n. Apply a small drop of thread–locking compound to the small outside diameter at the upper end of the Spindle.

o. Press the Spindle Upper Bearing, stamped side against the shims, onto the Spindle and allow the thread–locking compound to dry for a minimum of 10 minutes.

CAUTION

Make sure the Bevel Pinion is pulled outward toward the Bevel Pinion Bearing before inserting the Spindle into the Angle Head.

p. Lubricate the Spindle as previously instructed and insert the Spindle into the Angle Head until the Spindle Upper Bearing seats into the recess of the Angle Head.

q. Slip the Lower Spindle Bearing, stamped end out, over the end of the Spindle and against the face of the Angle Head.

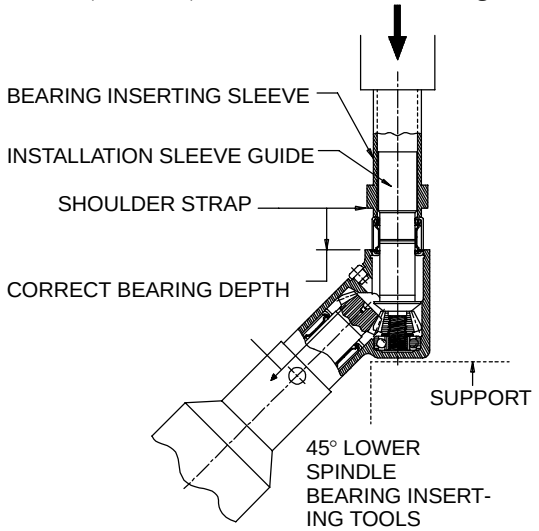
CAUTION

Do not attempt to press the Bearing into the housing with this guide. It is only to be used for alignment.

r. Insert the smaller diameter of the Installation Sleeve Guide (see Dwg. TPD794–1) into the Lower Spindle Bearing until it stops against the face of the Spindle.

s. Slide the shouldered end of the long Bearing Inserting Sleeve onto the Guide until the end of the Sleeve contacts the Lower Spindle Bearing.

t. With the closed end of the Angle Head resting on a flat surface, press the Lower Spindle Bearing into the housing until the shoulder of the Sleeve stops against the face of the Angle Head or until the stamped face of the Bearing is a maximum of 0.113” (2.88 mm) but not less than 0.108” (2.75 mm) below the face of the Angle Head.



(Dwg. TPD794–1)

u. Using a thin blade screwdriver, start one end of the Lower Spindle Bearing Retainer (119A) into the groove in the Angle Head. Rotate the screwdriver around the Spindle to spiral the Retainer into the groove.

10. Lubricate the Spindle Upper Bearing, Bevel Gear and Lower Spindle Bearing as previously instructed and install the Spindle into the Angle Head.
11. Clean the threads on the Angle Head and the Spindle Bearing Cap (121), apply a film of Vibra–Tite®* VC3 to the threads.
12. **For 7L1A1 or 7L1A3 Angle Head,** tighten the Spindle Bearing Cap to a minimum of 35 in–lb (3.9 Nm) torque.
    For 7L2A4 Angle Head, install the Spindle Bearing Cap and tighten the Cap to a minimum of 15 ft–lb (20.3 Nm) torque.
    For 7L3A4 Angle Head, using No. 8SA32–26 Bearing Cap Wrench, install the Spindle Bearing Cap and tighten the Cap to a minimum of 25 ft–lb (34 Nm) torque.
13. Slide the Coupling Nut (124), threaded end trailing, over the splined end of the Angle Head.
14. Apply the Coupling Nut Retainer (123) to the external groove on the splined end of the Angle Head.
15. Engage the spline on the Bevel Pinion with the matching spline in the Spindle (30) and thread the Coupling Nut onto the Gear Case. Tighten the Coupling Nut to a minimum of 25 ft–lb (34 Nm) torque. Check to make sure the Angle Head (101) aligns with the Throttle Lever (3).
16. **For 7L2A4 or 7L3A4 Angle Head,** thread the Drill Chuck onto the Spindle and tighten.

* Registered trademark of ND Industries.

TROUBLESHOOTING GUIDE

Trouble	Probable Cause	Solution
Loss of Power	Low air pressure	Check air supply. For top performance, the air pressure must be 90 psig (6.2 bar/620 kPa) at the inlet.
	Plugged Air Strainer Screen or Inlet Screen	Clean the Air Strainer or Inlet Screen in a clean, suitable, cleaning solution. If the Screen cannot be cleaned, replace it.
	Clogged Muffler or Exhaust Silencer	Clean the Muffler Element in a clean, suitable, cleaning solution. If it cannot be cleaned, replace it.
	Worn or broken Vanes	Replace the **complete** set of Vanes.
	Damaged Rear End Plate Gasket	Install a new Rear End Plate Gasket.
	Worn or broken Cylinder	Replace the Cylinder if it is cracked or if the bore appears wavy or scored.
	Improper lubrication or dirt build-up	Clean the Motor Unit parts and lubricate as instructed.
Leaky Throttle Valve	Worn Throttle Valve and/or Throttle Valve Seat	Install a new Throttle Valve and/or a ThrottleValve Seat.
	Dirt accumulation on Throttle Valve and/or Throttle Valve Seat	Pour about 3 cc of a clean, suitable, cleaning solution in the air inlet and operate the tool Valve for about 30 seconds. **Immediately** pour 3 cc of the recommended oil in the air inlet and operate the tool for 30 seconds to lubricate all the cleaned parts.
Gear Case gets hot	Excessive grease	Clean and inspect the Gear Case and gearing parts and lubricate as instructed.
	Worn or damaged parts	Clean and inspect the Gear Case and gearing. Replace worn or broken components.
Angle Head gets hot	Excessive grease	Clean and inspect the Angle Head and gearing. Lubricate as instructed.
	Inadequate grease	Inject 0.5 to 1.0 cc of grease into the Grease Fitting.
	Worn or damaged parts	Clean and inspect the Angle Head and Gearing. If the Bevel Gear and/or Bevel Pinion is worn or broken, replace **both** parts as they are a matched set.

NOTICE

SAVE THESE INSTRUCTIONS. DO NOT DESTROY.