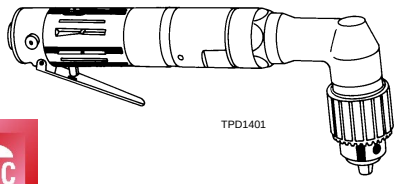


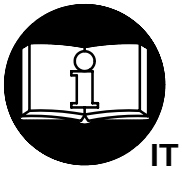
03534666
Form P6784
Edition 8
October, 2000

F
E
P

OPERATION AND MAINTENANCE MANUAL FOR SERIES 6L ANGLE DRILLS

NOTICE

Series 6L 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 (6.2 bar/620 kPa) 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.

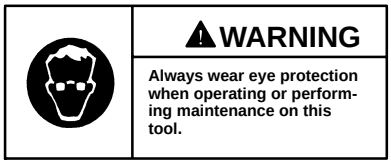
Printed in U.S.A.

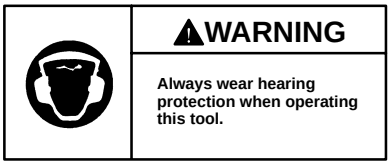
Ingersoll-Rand®

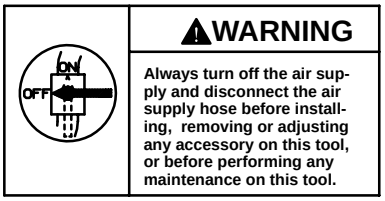
WARNING LABEL IDENTIFICATION

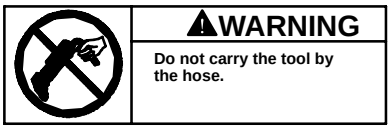
⚠ WARNING

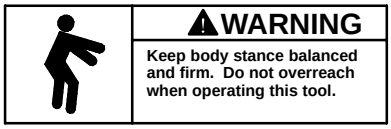
FAILURE TO OBSERVE THE FOLLOWING WARNINGS COULD RESULT IN INJURY.

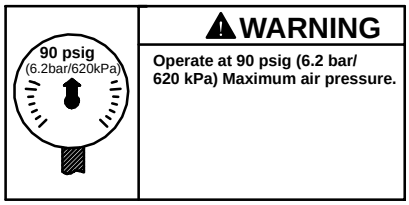












PLACING TOOL IN SERVICE

LUBRICATION

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

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

USA – C18–03–FKG0–28

Motor

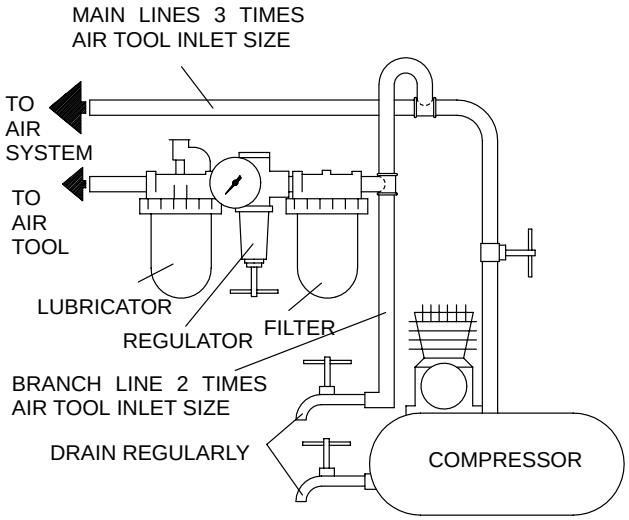
Before starting the Tool and after each eight hours of operation, unless the air line lubricator is used, detach the air hose and inject a few drops of oil into the air inlet.

Gearing

For models with H, J, JJ, K, or L gearing, after each 50,000 cycles or 160 hours of operation, whichever comes first, inject 6 – 8 cc of Ingersoll–Rand No. 67 Grease into the Grease Fitting.
For models with M, P, or R gearing, after each 50,000 cycles or 160 hours of operation, whichever comes first, inject 10 – 12 cc of Ingersoll–Rand No. 67 Grease into the Grease Fitting.

Angle Head

For models with the 7L1A1 Angle Attachment, **after each eight hours of operation**, inject 0.5 – 1 cc of Ingersoll–Rand No. 67 Grease into the Grease Fitting.
For models with the 7L2A4 or 7L3A4 Angle Attachment after each forty hours of operation, inject 0.5 – 1 cc of Ingersoll–Rand No. 67 Grease into the Grease Fitting.



(Dwg. TPD905–1)

HOW TO ORDER AN ANGLE DRILL

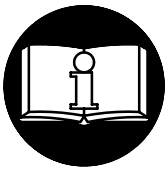
LEVER THROTTLE ANGLE HANDLE				LEVER THROTTLE ANGLE DRILL			
Model	**Free Speed rpm**	**Stall Torque**	**Female Threaded Spindle**	**Model**	**Free Speed rpm**	**Stall Torque**	**Female Threaded Spindle**
6LH1A1	6 000	23	1/4”–28	6LK2A41	2 000	65	1/4
6LJ1A1	5 100	27	1/4”–28	6LL2A42	1 400	95	1/4
6LJJ1A1	3 950	35	1/4”–28	6LP3A43	600	190	1/4
6LK1A1	3 100	45	1/4”–28	6LR3A44	400	320	1/4
6LL1A1	2 150	64	1/4”–28				

F

MANUEL D'EXPLOITATION ET D'ENTRETIEN DES PERCEUSES D'ANGLE DE LA SÉRIE 6L

NOTE

Les perceuses d'angle de la Série 6L 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.
L'EMPLOYEUR EST TENU DE COMMUNIQUER LES INFORMATIONS DE CE MANUEL AUX EMPLOYÉS UTILISANT CET OUTIL.
LE NON RESPECT DES AVERTISSEMENTS SUIVANTS PEUT CAUSER DES BLESSURES.**

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 (620 kPa). 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.

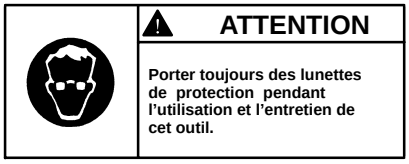
Imprimé aux É.U.

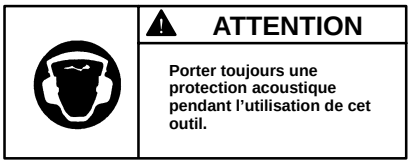
Ingersoll-Rand®

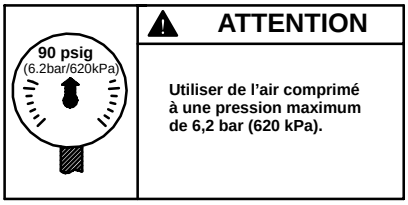
SIGNIFICATION DES ÉTIQUETTES D'AVERTISSEMENT

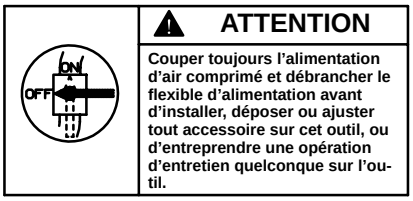
⚠ ATTENTION

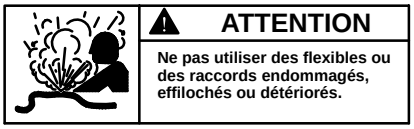
LE NON RESPECT DES AVERTISSEMENTS SUIVANTS PEUT CAUSER DES BLESSURES.











MISE EN SERVICE DE L'OUTIL

LUBRIFICATION

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

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

É.U. – C18–03–FKG0–28

Moteur

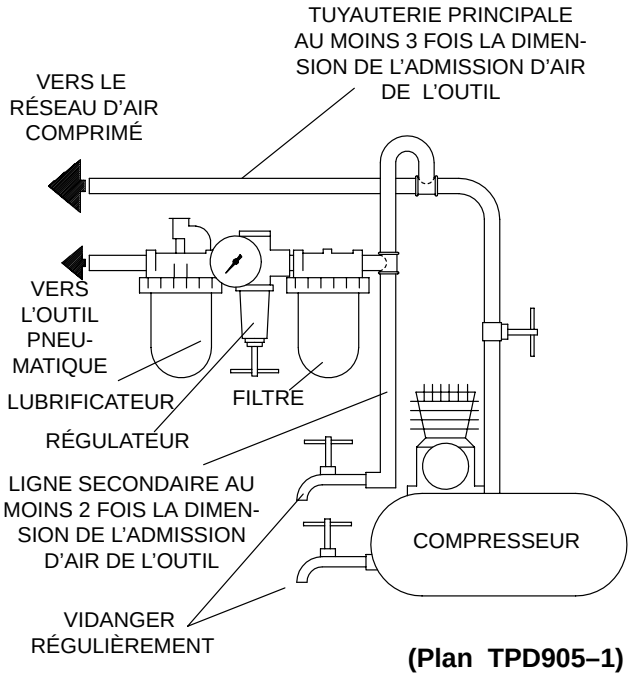
Avant de mettre l'outil en marche et tous les huit heures de fonctionnement, si un lubrificateur de ligne n'est pas utilisé, débrancher le flexible d'alimentation et injecter plusieurs gouttes d'huile dans le raccord d'admission.

Pignonnerie

Pour les modèles équipés de la pignonnerie H, J, JJ, K ou L, tous les 50 000 cycles ou 160 heures de fonctionnement, selon le cas, injecter 6 – 8 cm^3 de graisse Ingersoll–Rand No. 67 dans le raccord de graissage
Pour les modèles équipés de la pignonnerie M, P ou R, tous les 50 000 cycles ou 160 heures de fonctionnement, selon le cas, injecter 10–12 cm^3 de graisse Ingersoll–Rand No. 67 dans le raccord de graissage.

Renvoi d'angle

Pour les renvois d'angle 7L1A1, toutes les huit heures de fonctionnement, injecter 0,5 – 1 cm^3 de graisse Ingersoll–Rand No. 67 dans le raccord de graissage.
Pour les renvois d'angle 7L2A4 ou 7L3A4, toutes les quarante heures de fonctionnement, injecter 0,5 – 1 cm^3 de graisse Ingersoll–Rand No. 67 dans le raccord de graissage.



(Plan TPD905–1)

SPÉCIFICATIONS

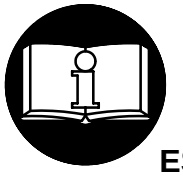
Modèle	Type de Poignée	Vitesse à vide	Couple de Calage	Broche à Filetage Intérieur
			pouces–lb (Nm)	
6LH1A1	Levier	6 000	23 (2,6)	1/4" – 28
6LJ1A1	Levier	5 100	27 (3,1)	1/4" – 28
6LJJ1A1	Levier	3 950	35 (4,0)	1/4" – 28
6LK1A1	Levier	3 100	45 (5,1)	1/4" – 28
6LL1A1	Levier	2 150	64 (7,3)	1/4" – 28
Modèle	**Type de Poignée**	**Vitesse à vide**	**Couple de Calage**	**Capacité du mandrin**
			pouces–lb (Nm)	
6LK2A41	Levier	2 000	65 (7,3)	1/4"
6LL2A42	Levier	1 400	95 (10,7)	3/8"
6LP3A43	Levier	600	190 (21,7)	3/8"
6LR3A44	Levier	400	320 (36,2)	1/2"

E

MANUAL DE USO Y MANTENIMIENTO PARA TALADROS ANGULARES DE LA SERIE 6L

NOTA

Los taladros angulares de la serie 6L están diseñados para las 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 USAR 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 kPa) 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 ni 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

- **Lleve siempre protección ocular cuando utilice esta herramienta o realice trabajos de mantenimiento de la misma.**
- **Lleve 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 ocurrir elevados pares de reacción a la presión recomendada de aire, e incluso a presiones inferiores.**
- **Los accesorios de la herramienta pueden seguir girando brevemente después de haberse soltado el mando.**
- **Las herramientas neumáticas pueden vibrar durante el uso. La vibración, los movimientos repetitivos y 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 recomendados por Ingersoll–Rand.**
- **Cuando se instale o reposicione la cabeza angular, la palanca de mando deberá colocarse de modo 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

Usar siempre protección ocular al manejar o realizar operaciones de mantenimiento en esta herramienta.

⚠ 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

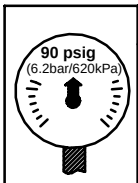
Mantener una postura del cuerpo equilibrada y firme. No estirar demasiado los brazos al manejar la herramienta.

⚠ ADVERTENCIA

Usar siempre protección para los oídos al manejar 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. 67

Use siempre un lubricante de aire con esta herramienta. Recomendamos el siguiente conjunto de filtro–lubricador–regulador:

EE. UU. – C18–03–FKG0–28

Motor

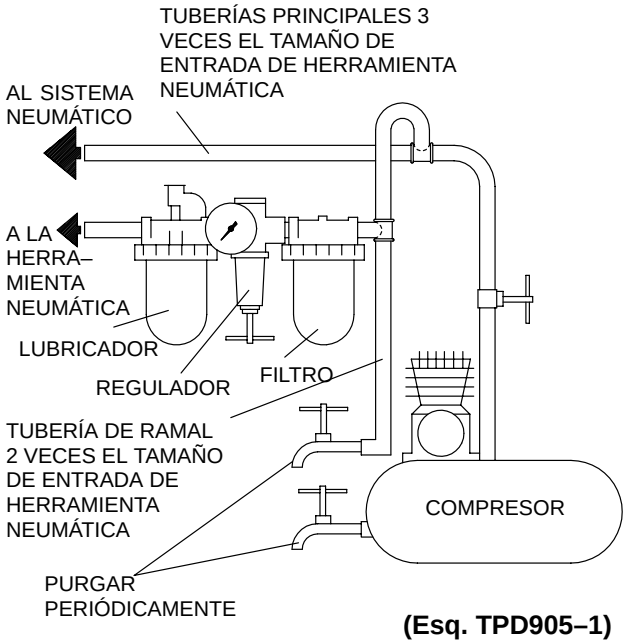
Antes de poner la herramienta en marcha y después de cada ocho horas de uso, a menos que se haya puesto un lubricante de línea de aire, desconecte la manguera de aire e inyecte unas gotas de aceite en la admisión de aire.

Engranajes

Para modelos con engranajes H, J, JJ, K o L, después de cada 50000 ciclos o 160 horas de funcionamiento (lo que ocurra primero), inyecte 6 – 8 cc de grasa Ingersoll–Rand Nº. 67 en el engrasador.
Para modelos con engranajes M, P o R, después de cada 50000 ciclos o 160 horas de funcionamiento (lo que ocurra primero), inyecte 10–12 cc de grasa Ingersoll–Rand Nº. 67 en el engrasador.

Cabeza angular

Para modelos con el acoplamiento angular 7L1A1, **después de cada ocho horas de funcionamiento** , inyecte 0,5 – 1 cc de grasa Ingersoll–Rand Nº. 67 en el engrasador.
Para modelos con el acoplamiento angular 7L2A4 o 7L3A4, **después de cada cuarenta horas de funcionamiento,** inyecte 0.5 – 1 cc de grasa Ingersoll–Rand Nº. 67 en el engrasador.



(Esq. TPD905–1)

ESPECIFICACIONES

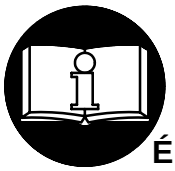
Modelo	Tipo de empuñadura	Velocidad en vacío	Par de calado	Husillo roscado hembra
			pulg.–lb (Nm)	
6LH1A1	Palanca	6 000	23 (2,6)	1/4 pulg. – 28
6LJ1A1	Palanca	5 100	27 (3,1)	1/4 pulg. – 28
6LJJ1A1	Palanca	3 950	35 (4,0)	1/4 pulg. – 28
6LK1A1	Palanca	3 100	45 (5,1)	1/4 pulg. – 28
6LL1A1	Palanca	2 150	64 (7,3)	1/4 pulg. – 28
Modelo	**Tipo de empuñadura**	**Velocidad en vacío**	**Par de calado**	**Capacidad del portapuntas**
			pulg.–lb (Nm)	
6LK2A41	Palanca	2 000	65 (7,3)	1/4 pulg.
6LL2A42	Palanca	1 400	95 (10,7)	3/8 pulg.
6LP3A43	Palanca	600	190 (21,7)	3/8 pulg.
6LR3A44	Palanca	400	320 (36,2)	1/2 pulg.

MANUAL DE FUNCIONAMENTO E MANUTENÇÃO PARA PERFURADORAS EM ÂNGULO SÉRIES 6L

P

AVISO

As Perfuradoras em Ângulo 6L são concebidas para aplicações de perfuração em indústrias de automóveis, 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 6,2 bar/620 kPa (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 impactar 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®

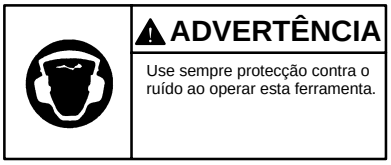
IDENTIFICAÇÃO DO RÓTULO DE ADVERTÊNCIA

⚠ 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

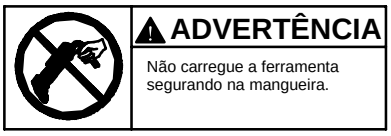
Use sempre protecção contra o ruído ao operar esta ferramenta.

⚠ 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.

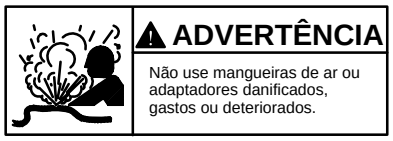
⚠ ADVERTÊNCIA

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

Não carregue a ferramenta segurando na mangueira.

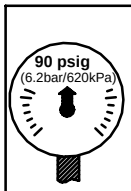


⚠ ADVERTÊNCIA

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

⚠ 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

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

COLOCANDO A FERRAMENTA EM FUNCIONAMENTO

LUBRIFICAÇÃO

Ingersoll–Rand No. 10

Ingersoll–Rand No. 67

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

E.U.A. – 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

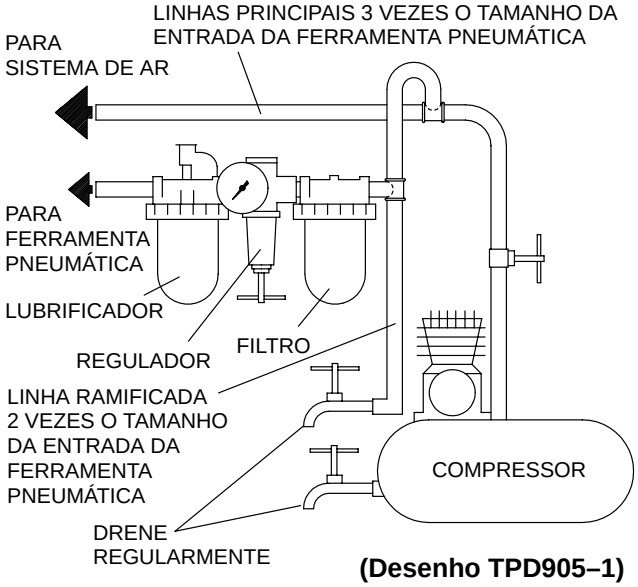
Para modelos com engrenagem H, J, JJ, K ou L, depois de cada 50 000 ciclos ou 160 horas de operação, o que ocorrer primeiro, injecte 6–8 cc de Massa Ingersoll–Rand No. 67 no Adaptador de Massa.

Para modelos com engrenagem M, P, ou R, depois de cada 50 000 ciclos ou 160 horas de operação, o que ocorrer primeiro, injecte 10–12 cc de Massa Ingersoll–Rand No. 67 no Adaptador de Massa.

Cabeçote em Ângulo

Para modelos com o Conector em Ângulo 7L1A1, depois de cada oito horas de operação, injecte 0,5 – 1 cc de Massa Ingersoll–Rand No. 67 no Adaptador de Massa.

Para modelos com o Conector em Ângulo 7L2A4 ou 7L3A4, depois de cada quarenta horas de operação, injecte 0,5 – 1 cc de Massa Ingersoll–Rand No. 67 no Adaptador de Massa.

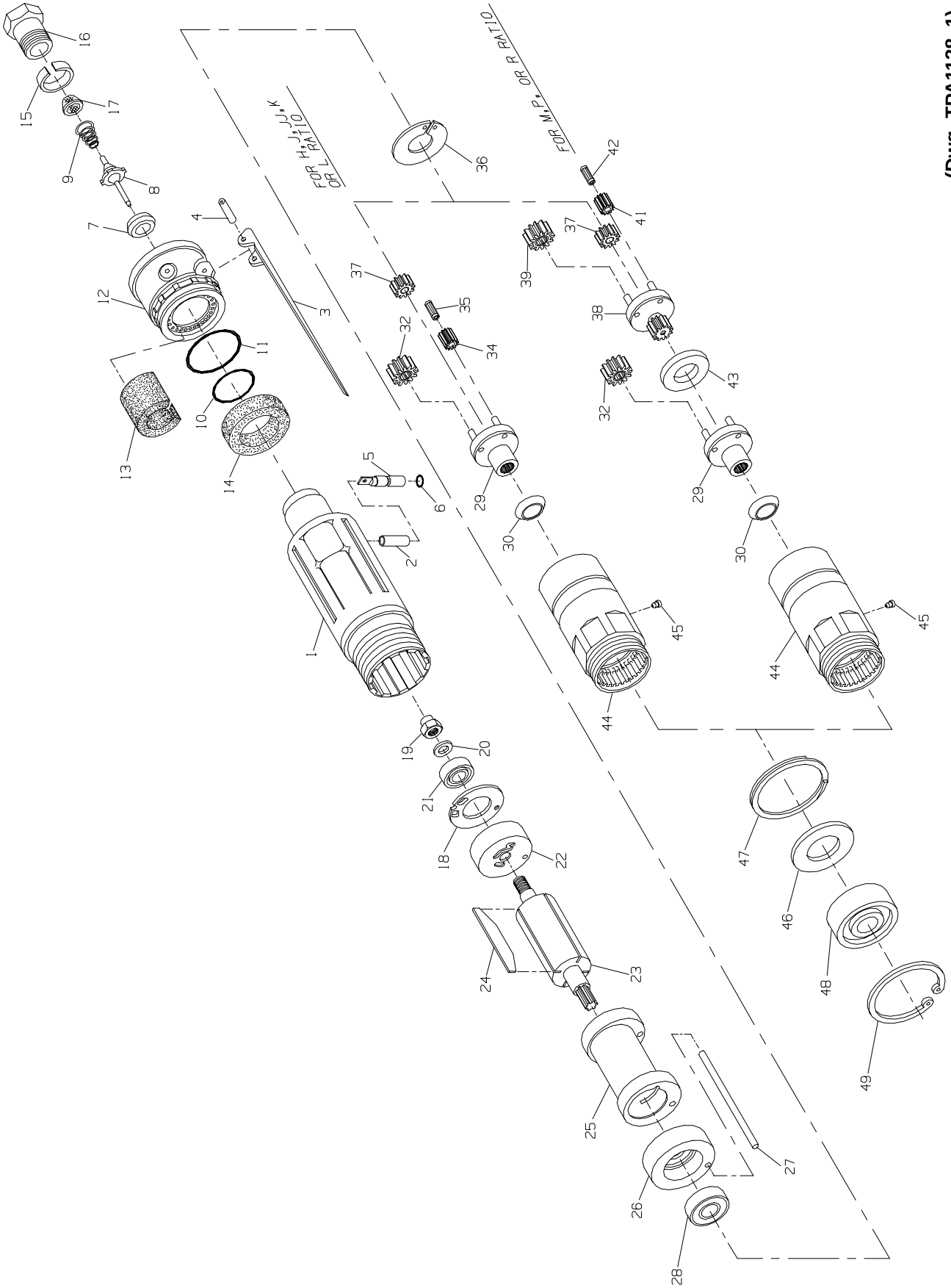


(Desenho TPD905–1)

ESPECIFICAÇÕES

Modelo	Tipo de Punho	Velocidade Livre	Torque Máximo	Fuso de Rosca Fêmea
		rpm	Nm (pol–lb)	
6LH1A1	alavanca	6 000	2,6 (23)	1/4” – 28
6LJ1A1	alavanca	5 100	3,1 (27)	1/4” – 28
6LJJ1A1	alavanca	3 950	4,0 (35)	1/4” – 28
6LK1A1	alavanca	3 100	5,1 (45)	1/4” – 28
6LL1A1	alavanca	2 150	7,3 (64)	1/4” – 28
Modelo	**Tipo de Punho**	**Velocidade Livre**	**Torque Máximo**	**Capacidade do Encabadouro**
		rpm	**Nm (pol–lb)**	
6LK2A41	alavanca	2 000	7,3 (65)	1/4”
6LL2A42	alavanca	1 400	10,7 (95)	3/8”
6LP3A43	alavanca	600	21,7 (190)	3/8”
6LR3A44	alavanca	400	36,2 (320)	1/2”

MOTOR AND GEARING



(Dwg. TPA1138–1)

		PART NUMBER FOR ORDERING	
		Motor Housing Assembly	
		for models ending in –EU	6LH–EU–A40
		for all other models	6LH–A40
	1	Motor Housing	
		for models ending in –EU	6WS–EU–B40
		for all other models	6WS–B40
	2	Throttle Plunger Bushing	7L–91
	*	Warning Label	WARNING–7–99
	3	Throttle Lever	7L–273
	4	Throttle Lever Pin	7L–120
	5	Throttle Plunger Assembly	5LK2C–A94
♦•	6	Throttle Plunger Seal	6LL–259
♦	7	Throttle Valve Seat	7AH–303
♦	8	Throttle Valve	7AH–302
♦	9	Throttle Valve Spring	7L–51
♦	10	Silencer Seal Ring	WWV100A1–43
♦•	11	Exhaust Deflector Seal	R00A2–103
	12	Rear Muffler	6WS–A23
♦•	13	Muffler Element	3RA–310
♦	14	Exhaust Silencer (2 for Model 6LR3; 1 for all other models)	4RL–311
	15	Inlet Bushing Spacer	7AH–65
	16	Inlet Bushing	7L–565
♦•	17	Air Strainer Screen	R0A2–61
	*	Warning Label	
		for models ending in –EU	EU–99
		for all other models	WARNING–7–99
♦•	18	Rear End Plate Gasket	6WRT–739
♦•	19	Rear Rotor Bearing Retaining Nut	6WT–118

		PART NUMBER FOR ORDERING	
♦•	20	Bearing Thrust Washer	6WT–117
	21	Rear Rotor Bearing	DG20–22
♦	22	Rear End Plate	6AH–12
	23	Rotor	
		for H, J, M or P ratio (9 teeth)	6AH–53
		for JJ ratio (12 teeth)	6AJ–53
		for K or R ratio (9 teeth)	6AK–53
		for L or S ratio (6 teeth)	6AL–53
♦•	24	Vane Packet (set of 4 Vanes)	6WT–42–4
	25	Cylinder	6AH–3
	26	Front End Plate	6WT–11
	27	Cylinder Dowel	6WT–98
♦•	28	Front Rotor Bearing	R00H–97
	29	Spindle Assembly	
		for H ratio	6LH–A8
		for J ratio	6LJ–A8
		for JJ ratio	6LJJ–A8
		for P, R or S ratio	6LP–A8
		for K ratio	6LK–A8
		for L ratio	6LL–A8
		for M ratio	6LN–A8
	30	Seal Support	5RAK–5
	32	Spindle Planet Gear Assembly (3)	
	+	for K ratio (20 teeth)	6WTK–A10
	+	for L ratio (20 teeth)	6WTL–A10
		for J or M ratio (16 teeth)	6WTN–A10
		for JJ, P, R or S ratio (18 teeth)	6WTP–A10

* 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 12345678 bullet (•) for every four tools in service.

♦ Indicates Tune–up Kit part.

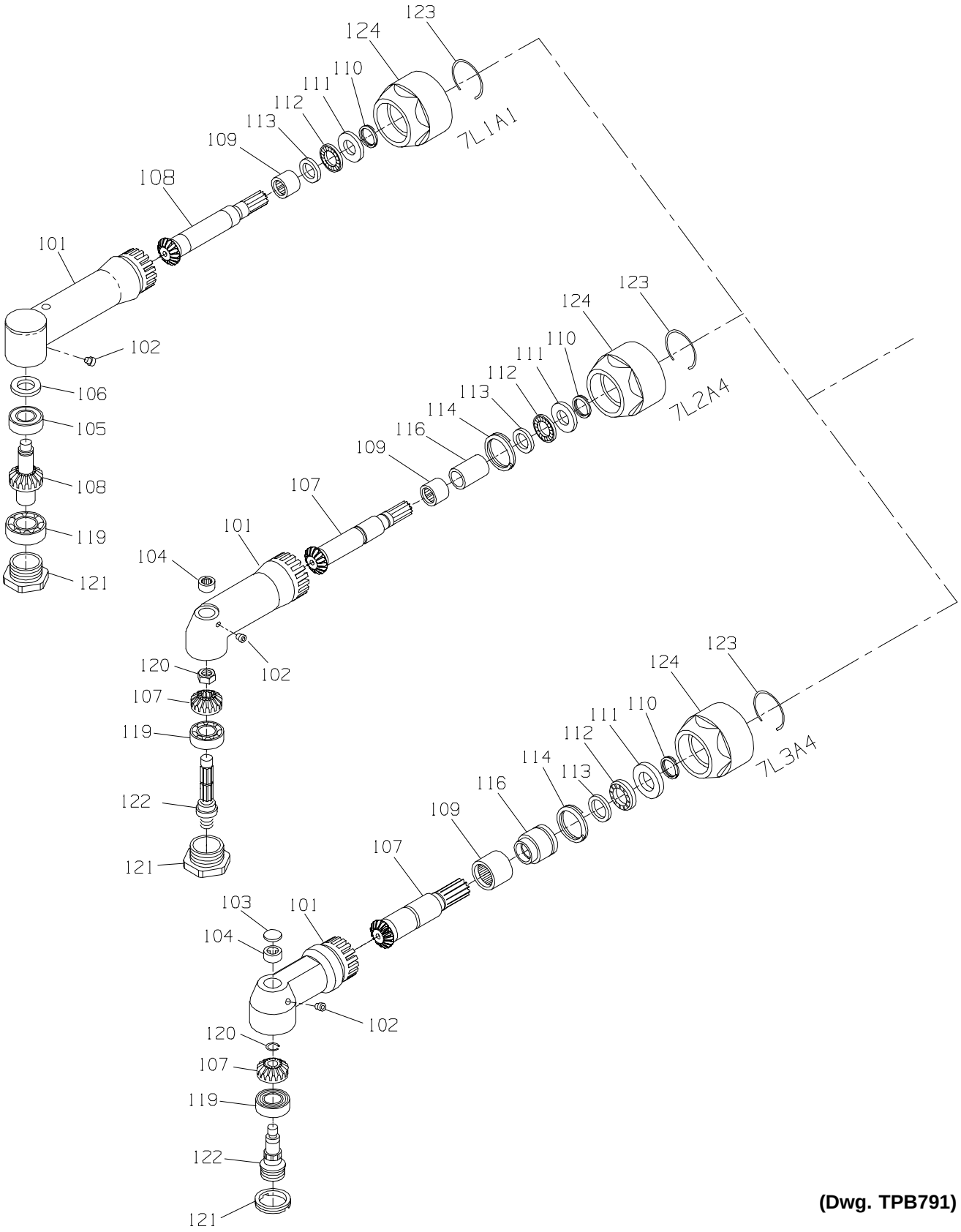
\+ The gears used in both the No. 6WTL–A10 and No. 6WTK–A10 Planet Gear Assemblies have 20 teeth. The Gear (Part No. 6WTK–A10) can be distinguished by the annular groove through the middle of the tooth.

		PART NUMBER FOR ORDERING
34	Spindle Planet Gear (for H ratio) (3)	6WTM–10
35	Planet Gear Bearing (for H ratio) (3)	6WTM–500
36	Gear Retainer	6LL–81
37	Rotor Pinion	
	for H,M or S ratio	6WTM–17
	for J or P ratio	6WTN–17
38	Gear Head	
	for M ratio (marked M)	6LM–216
	for P ratio (marked P)	6LP–216
	for R ratio (marked R)	6LR–216A
	for S ratio (marked S)	6AS–216
39	Gear Head Planet Gear Assembly (3)	
	for P ratio (16 teeth)	6WTN–A10
	for R ratio (20 teeth)	6WTK–A10
	for S ratio (20 teeth)	6WTL–A10
41	Gear Head Planet Gear (for M ratio) (3)	6WTM–10
42	Planet Gear Bearing (for M ratio) (3)	6WTM–500
43	Gear Head Spacer (for M, P, R or S ratio)	6LM–80
	Gear Case Assembly	
	for H, J, JJ, K or L ratio	6LL–A37
	for M, P, R or S ratio	6LM–A37
44	Gear Case	
	for M, J, JJ, K or L ratio	6LL–B37
	for M, P, R or S ratio	6LM–B37
45	Grease Fitting	D0F9–879
46	Grease Shield	5R–701

		PART NUMBER FOR ORDERING
47	Grease Shield Retainer	6LL–343
48	Spindle Bearing	R1L–24
49	Spindle Bearing Retainer	7L–28
*	Drill Chuck (includes Chuck Key)	
	for K ratio (0 to 1/4”	
	[0 to 6 mm] capacity)	R00A–99
	for L, M, P or S ratio (0 to 3/8”	
	[0 to 10 mm] capacity)	6A–99
	for R ratio (0 to 1/2”	
	[0 to 13 mm] capacity)	R0K–99
*	Chuck Key	
	for R00A–99	R00A–1253
	for 6A–99	R0J–1253
	for R0K–99	R1T–1253
*	Horizontal Hanger	6W5–366
*	Vertical Hanger	7L–365
*	Grease Gun	R000A2–228
*	Piped–Away Exhaust Kit	7L–K284
*	Tune–up Kit (includes illustrated items 6, 7, 8, 9, 10, 11, 13, 14 [2], 17, 18, 19, 20, 21, 24 and 28)	6–DRlLLS–TKl
*	Pressing Fixture	7L1A–950

* Not illustrated.

ANGLE ATTACHMENTS



(Dwg. TPB791)

PART NUMBER FOR ORDERING

		7L1A1	7L2A4	7L3A4
	Angle Drill Attachment	7L1A1	7L2A4	7L3A4
101	Angle Housing Assembly	7L1A–B550	7L2A–B550	7L3A–B550
102	Grease Fitting	D0F9–879	D0F9–879	D0F9–879
103	Angle Housing Cap	—	—	8SA32–110
• 104	Spindle Upper Bearing	—	120A4–603	85A32–603
105	Spindle Upper Bearing	7L1A–603	—	—
• 106	Upper Bearing Shim Packet (two thicknesses of Shims)	7L1A–P448	—	—
• 107	Matched Bevel Gear Set	—	141A12–A552	7L3A–A552
• 108	Spindle Assembly (1/4”–28 female thread)	7L1A1–A591	—	—
• 109	Bevel Pinion Bearing	7AH–24	H54U–511B	182A53–606
110	Bearing Seat Retainer	W22–6	1415A12–6	1415A12–6
111	Rear Thrust Bearing Seat	7L2A–682	7L2A–682	7L2A–682
112	Bevel Pinion Thrust Bearing	3RL2–105	161A32–105	161A32–105
113	Front Thrust Bearing Seat	7L1A–683	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	7L1A–593	120A4–593	8SA32–593
120	Bevel Gear Retainer	—	120A4–578	8SA32–578
121	Spindle Bearing Cap	7L1A–531	7L2A4–531	8SA32–531
122	Spindle (3/8”–24 male thread)	—	7L2A4–791	7L3A4–791
123	Coupling Nut Retainer	5C1–29	5C1–29	5C1–29
124	Coupling Nut	7L–27	7L–27	7L–27
*	Bearing Inserting Tool	7L1A–950	7L2A–950	7L3A–950
*	Lower Bearing Cap Wrench	—	—	8SA32–26

* 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.

⚠ 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 6L Angle Drills are disassembled for maintenance, repair or replacement of parts, lubricate the tool as follows:

1. Moisten all O–rings with O–ring lubricant.
2. Work approximately 1.5 cc of grease into the Rear Rotor Bearing (21), Front Rotor Bearing (28) and the Spindle Bearing (48).
3. Work approximately 6 cc to 8 cc of grease into the H, J, JJ, K or L ratio gear train and 10 cc to 12 cc of grease into the M, P or R ratio gear train. Grease the Planet Gear Bearings (32, 35, 39 and 42), the gear teeth inside the Gear Case (44) and the planet gear shafts on the Spindle (29) and Gear Head (38).
4. Work approximately 0.5 cc to 1.0 cc of grease into the Lower Spindle Bearing (119).
5. Work approximately 0.5 cc to 1.0 cc of grease into the Upper Spindle Bearing (104 or 105), Bevel Pinion Bearing (109) and Bevel Pinion Thrust Bearing (112). Apply 6 cc to 8 cc of grease to the Matched Bevel Gear Set (107) used in 7L3A4 Angle Attachments, 2 cc to 4 cc of grease to the Matched Bevel Gear Set used in 7L2A4 Angle Attachments and a maximum of 0.5 cc of grease to the bevel gears of the Spindle Assembly (108) used in 7L1A1 Angle Attachments.

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 Angle Attachment

1. Remove the Drill Chuck by inserting the short leg of a 1/4" hex key into the Chuck and tightening the Chuck. Rap the long leg of the key sharply with a hammer to remove the Chuck.
2. Carefully grasp the flats of the Coupling Nut (124) in copper–covered vise jaws, Angle Head (101) facing down.

NOTICE

Gear Case has left–hand threads.

3. Using a wrench on the flats of the Gear Case (44), loosen but do not remove the Gear Case from the Coupling Nut.
   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 (108 or 122) facing upward.

NOTICE

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

5. For 7L1A1 Angle Head, using a wrench, remove the Spindle Bearing Cap.

NOTICE

Do not remove the Spindle from the Angle Head until the bevel pinion of the Spindle Assembly (108) is pulled outward against the Bevel Pinion Bearing (109). Failure to do so could damage the Spindle Upper Bearing (105). If tightness or binding occurs, check to make sure the bevel pinion has been pulled outward.

NOTICE

Spindle Bearing Cap has left–hand threads.

For 7L2A4 Angle Head, use a wrench to remove the Spindle Bearing Cap (121). Withdraw the Spindle (122) from the Angle Head.

NOTICE

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 (122) from the Angle Head.

6. Inspect the Lower Spindle Bearing (119) for looseness or roughness. If either of these conditions exists, replace the bearing as follows:
   a. **For 7L1A1 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 120).
f. Press off the Bevel Gear. Press the Spindle from the Lower Spindle Bearing.

NOTICE

Do not remove the Spindle Upper Bearing (105) unless you 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 7L1AI Angle Head,** if the Spindle Upper Bearing appears rough or loose, press 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 (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 Pinion Bearing Spacer (116).
   For 7L3A4 Angle Head, use a thin blade screwdriver to pry out and under the tab of the Pinion Bearing Spacer Retainer (114). 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 Angle Head.

NOTICE

Do not remove the pinion shaft and bearing unless you a have new bearing on hand.

10. 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 (109). After the Angle Head is disassembled, check all parts for damage or wear.
    For 7L1A1 Angle Head, if the gear teeth on either the spindle or bevel pinion of the Spindle Assembly (108) are worn or chipped, replace both parts. They are furnished in a matched set and must be replaced with a matched set.
    For 7L2A4 or 7L3A4 Angle Head, if the gear teeth on either of the Bevel Gears (107) are worn or chipped, replace both parts. They are furnished in a matched set and must be replaced with a matched set.

Disassembly of the Gearing

1. Being careful not to distort the Motor Housing (1), grasp the flats on the Housing in leather–covered or copper–covered vise jaws with the Gear Case (44) facing upward.
2. Using a wrench on the flats of the Gear Case, loosen, but do not remove the Gear Case.

NOTICE

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

3. Remove the tool from the vise and, while holding the tool horizontally, carefully unscrew the Gear Case by hand and pull it away from the Motor Housing.
4. Using snap ring pliers, remove the Gear Retainer (36).
5. **For H, J, M or P ratio,** the Rotor Pinion (37) may come out with the Gear Case, or it may have remained with the Rotor (23) when the Gear Case was removed. Remove the Rotor Pinion.
6. **For M, P or R ratio,** remove the Gear Head Planet Gear Assemblies (39) or Gear Head Planet Gears (41), Gear Head Planet Gear Bearings (42), Gear Head (38) and Gear Head Spacer (43).
7. Remove the Spindle Planet Gear Assemblies (32) or Spindle Planet Gears (34) and Spindle Planet Gear Bearings (35).
8. Position the Gear Case vertically in an arbor press, with the motor end down. Using a 7/16” (11 mm) diameter brass rod against the outer rim of the Spindle (29), press the Spindle from the Gear Case.
9. Using snap ring pliers, remove the Spindle Bearing Retainer (49).
10. Tap the externally threaded end of the Gear Case on a workbench to remove the Grease Shield (46) and Spindle Bearing (48).
11. Remove the Seal Support (30) from the Spindle.
12. If the Grease Shield Retainer (47) must be removed, insert a thin blade screwdriver under the tab, and using a rotary motion, spiral the Retainer out of the groove in the Gear Case.

Disassembly of the Motor and Throttle

1. Using a pin punch and hammer, drive the Throttle Lever Pin (4) out of the Rear Muffler (12) to release the Throttle Lever (3).
2. Grasp the splined end of the Rotor (23) in leather–covered or copper–covered vise jaws and pull the assembled motor from the Motor Housing (1).
3. Remove the Rear End Plate Gasket (18) from the Motor Housing.
4. Using a wrench, unscrew and remove the Rear Rotor Bearing Retaining Nut (19).
5. Remove the Rotor from the vise and remove the Bearing Thrust Washer (20), Rear End Plate (22), Cylinder (25) and Vanes (24).
6. Check the Front Rotor Bearing (28) for damage or roughness. If replacement is necessary, support the Front End Plate (26) between two blocks of wood on the table of an arbor press. Press the Rotor from the Front Rotor Bearing. Using a flat face punch on the inner ring, tap the Bearing out of the End Plate.
7. Check the Rear Rotor Bearing (21) for damage or roughness. If replacement is necessary, use a flat face punch on the inner ring and tap the Bearing out of the End Plate.
8. Being careful not to distort the Housing, grasp the flats on the Motor Housing in leather–covered or copper–covered vise jaws with the inlet upward.
9. Using a wrench on the flats, unscrew and remove the Inlet Bushing (16) and the Air Strainer Screen (17).
10. Remove the Throttle Valve Spring (9).
11. Remove the Rear Muffler (12), Inlet Bushing Spacer (15), two Exhaust Silencers (14), Muffler Element (13), Exhaust Deflector Seal (11) and the Silencer Seal Ring (10).
12. Lift out the Throttle Valve (8) and Throttle Plunger Assembly (5).
13. Remove the Throttle Plunger Seal (6) from the Throttle Plunger.

NOTICE

Only remove the Throttle Valve Seat (7) when replacing it or when the Throttle Plunger Bushing (2) must be replaced.

14. To remove the Throttle Valve Seat, insert a wire hook through the central hole of the Seat and hooking the underside of the Seat; pull the Seat out of the Motor Housing.
15. Before removing the Throttle Plunger Bushing (2) all seals and components must be removed from the Motor Housing. To remove the Throttle Plunger Bushing, proceed as follows:
    a. Grasp the rear hub of the Motor Housing in leather–covered or copper–covered vise jaws with the Throttle Plunger Bushing upward.

CAUTION

Apply enough heat to warm the Housing, but not enough heat to distort it.

    b. Using a torch, apply heat to the Motor Housing around the Bushing.
    c. Thread a 5/16”–18 tap into the Bushing and pull the Bushing out of the Housing with the tap.

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. Unless otherwise noted, always press on the stamped end of a needle bearing when installing the needle bearing in a recess.
4. 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.
5. Always clean every part and wipe every part with a thin film of oil before installation.
6. Apply a film of O–ring lubricant to all O–rings before final assembly.
7. Check every bearing for roughness. If an open bearing must be cleaned, wash it thoroughly in a 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.

Assmbly of the Motor and Throttle

1. If the Throttle Plunger Bushing (2) was removed, proceed as follows:
    a. Insert the Throttle Plunger Bushing into the Motor Housing (1) to a depth approximately one–half the length of the Bushing.
    b. Put a few drops of a quality sealant in the counterbore surrounding the outside diameter of the Bushing.
    c. Rotate the Bushing approximately 180° to make certain the sealant makes complete contact around the outside of the Bushing.
    d. Push the Bushing into the Housing until it bottoms against the shoulder inside the Housing.
    e. Allow the sealant to cure for eight hours at room temperature.

2. Carefully grasp the flats on the Motor Housing (1) in leather–covered or copper–covered vise jaws, inlet end facing upward.
3. If the Throttle Valve Seat (7) was removed, use a flat–faced rod 1/2" (12.7 mm) in diameter by 3" (76 mm) long to push the Seat into the Motor Housing until it seats.
4. Install the Throttle Plunger Seal (6) in the groove of the Throttle Plunger (5).
5. Insert the Throttle Plunger into the Plunger Bushing and rotate the Plunger until the hole in the Plunger aligns dead center with the hole in the Throttle Valve Seat.
6. Using needle nose pliers to hold the short–stem end of the Throttle Valve (8), install the Valve inserting the long stem end through the hole in the Throttle Valve Seat and Throttle Plunger.
7. After folding the Muffler Element (13) lengthwise, and with the fold trailing, install the Element by wrapping it horseshoe fashion around the inside of the Rear Muffler (12) covering all exhaust holes.
8. Install the Exhaust Deflector Seal (11) into the groove on the front end of the Rear Muffler.
9. Install the two Exhaust Silencers (14) over the hub at the rear of the Motor Housing and work the Silencers into the Housing.
10. Install the Silencer Seal Ring (10) over the hub of the Motor Housing approximately halfway down the hub.

NOTICE

Tabs on the Rear Muffler match notches on the Motor Housing. Do not force the Muffler into place.

11. Install the Rear Muffler over the hub of the Motor Housing, aligning the wide tab on the Rear Muffler with the throttle plunger hole in the Motor Housing.
12. Insert the Air Strainer Screen (17), closed end first, inside the external threaded end of the Inlet Bushing (16).
13. Insert the Throttle Valve Spring (9), large coil end first, into the Inlet Bushing making sure it contacts the Air Strainer Screen.
14. Install the Inlet Bushing Spacer (15) in the large hole in the Rear Muffler.
15. 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 26 ft–lb (35 Nm) torque. The Inlet Bushing must securely clamp the Rear Muffler.
16. Note that the throttle lever pinhole in the Rear Muffler is larger at one end than the other. Install the Throttle Lever (3), pressing the Throttle Lever Pin (4) into the large end of the pinhole.
17. Using a sleeve that contacts the outer ring of the Rear Rotor Bearing (21), press the Rear Rotor Bearing into the Rear End Plate (22).

NOTICE

The Rotor must spin freely while holding the End Plate.

18. Place the Rear End Plate, Bearing end trailing, on the threaded hub of the Rotor (23). Insert a 0.001" feeler gauge or shim between the face of the Rotor and the End Plate. Place the Bearing Thrust Washer (20) on the threaded hub of the Rotor. Thread the Rear Rotor Bearing Retaining Nut (19) onto the hub of the Rotor and tighten it until the feeler gauge has a slight drag during removal.
19. Lightly grasp the threaded hub of the Rotor in leather–covered or copper–covered vise jaws with he splined hub upward.
20. Wipe each Vane (24) with a film of light oil and place a Vane in each slot in the Rotor.
21. Looking down the axis of the Rotor and Cylinder (25), position the Cylinder over the Rotor with the cylinder dowel hole at twelve o'clock, the notch in cylinder face at ten o'clock and the two slots in the side of the Cylinder at two o'clock. Place the Cylinder down over the Rotor and Vanes and against the Rear End Plate.
22. Push the Front Rotor Bearing (28) into the recess in the Front End Plate (26).

NOTICE

Align the cylinder dowel hole in the Rear End Plate, Cylinder and Front End Plate before pressing the Bearing onto the shaft.

23. Remove the assembled Rotor from the vise and using a sleeve that contacts the inner ring of the Front Rotor Bearing, press the Bearing, flat side of the Front End Plate first, onto the rotor shaft. After pressing the bearing onto the shaft, lightly rap the end of the splined hub with a plastic hammer to relax the load on the Bearing. The Rotor must rotate in the Bearing without drag.
24. Position the Rear End Plate Gasket (18) in the bottom of the motor housing bore so that 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 holes in the Front End Plate, Cylinder and Rear End Plate. Insert the assembly rod through the aligned holes so that about 3” (76 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 (27) until the Cylinder Dowel is slightly below the surface of the Front End Plate.

Assembly of the Gearing

1. If the Grease Shield Retainer (47) was removed, install it in the second groove below the front face of the Gear Case (44).
2. Support the face of the Spindle (29), pin end downward, on the table of an arbor press.
3. **For H, J or JJ ratio,** install the Seal Support (30), large end first, and Grease Shield (46) over the hub of the Spindle.
   For K, L, M, P or R ratio, install the Seal Support (30), large end first and Grease Shield (46) over the hub of the Spindle.
4. Using a sleeve that contacts the inner ring of the Bearing, press the Spindle Bearing (48) onto the hub of the Spindle until the Bearing seats against the Seal Support.
5. Insert the assembled Spindle, pin end first, into the front end of the Gear Case until the Grease Shield is flush against the Grease Shield Retainer.
6. Using snap ring pliers, install the Spindle Bearing Retainer (49) in the groove ahead of the Spindle Bearing.
7. **For H ratio,** push the Spindle Planet Gear Bearings (35) into the Spindle Planet Gears (34).
8. **For H ratio,** grease the assembled Spindle Planet Gears and Bearings and install them on the pins of the Spindle.
   For J, JJ, K, L, M, P or R ratio, grease the bearings and gears of the Spindle Planet Gear Assemblies (32) and install them on the pins of the Spindle.
9. **For M, P or JJ ratio,** install the Gear Head Spacer (43) in the Gear Case against the Spindle Planet Gears.
10. **For M, P or R ratio,** grease the splined hub of the Gear Head (38) and insert it into the Gear Case. The splined hub must pass through the Gear Head Spacer and mesh with the teeth of the Spindle Planet Gears.
11. **For M ratio,** push the Gear Head Planet Gear Bearings (42) into the Gear Head Planet Gears (41).
12. **For M ratio,** grease the assembled Gear Head Planet Gears and Bearings and install them on the pins of the Gear Head.
    For P or R ratio, grease the bearings and gears of the Gear Head Planet Gear Assemblies (39) and install them on the pins of the Gear Head.
13. **For H or J ratio,** grease the Rotor Pinion (37) and install it in the center of the Spindle Planet Gears. Make certain the teeth of the Pinion and Planet Gears mesh.
    For M or P ratio, grease the Rotor Pinion (37) and install it in the center of the Gear Head Planet Gears. Make certain the teeth of the Pinion and Planet Gears mesh.
14. Using snap ring pliers, install the Gear Retainer (36) in the shallow internal groove in the Gear Case behind the Spindle Planet Gears or Gear Head Planet Gears.
15. Thread the assembled Gear Case onto the assembled Motor Housing until it is hand–tight. Make certain the gear teeth on the Spindle mesh with the gear teeth of the Rotor Pinion, Gear Head Planet Gears or Spindle Planet Gears.

NOTICE

Run the motor at free speed on low air pressure while final tightening the Gear Case. Listen while tightening to make certain the gears mesh properly.

16. Tighten the Gear Case between 30 to 35 ft–lb (41 to 47 Nm) torque.

Assembly of the Angle Attachment

1. Lubricate Bevel Pinion (107 or 108) as instructed in **Lubrication** and insert it, gear end first, into the long bore of Angle Head (101).
2. Lubricate the Bevel Pinion Bearing (109) as instructed in **Lubrication** and insert it, unstamped end first, into the bore of the Angle Head, after the Bevel Pinion.
3. **For 7L1A1 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 7L12A4 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.

NOTICE

Check to make sure the Pinion Bearing Spacer Retainer (114) is completely seated.

4. **For 7L2A4 Angle Head,** install the Bevel Pinion Bearing Spacer (116). Using snap ring pliers, install the Pinion Bearing Spacer Retainer.
   For 7L3A4 Angle Head, install the Bevel Pinion Bearing Spacer 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 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.
5. Lubricate the Bevel Pinion Thrust Bearing (112) as instructed in **Lubrication**. Install in order named the Front Thrust Bearing Seat (113), Bevel Pinion Thrust Bearing, 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 onto the Spindle.
8. **For 7L2A4 Angle Head,** apply a thread–locking primer to the thread on the Bevel Gear Retainer (120) and Spindle. Allow the primer to cure for five minutes. Apply a quality thread–locking compound to the thread on the Bevel Gear Retainer and tighten it on the Spindle to 10 ft–lb (13.5 Nm) torque.
   For 7L3A4 Angle Head, spread the Bevel Gear Retainer (120) 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:
   a. **For 7L1A1 Angle Head,** apply a small drop of a quality sealant to the small outside diameter of the Upper Spindle Bearing Shaft.

⚠CAUTION

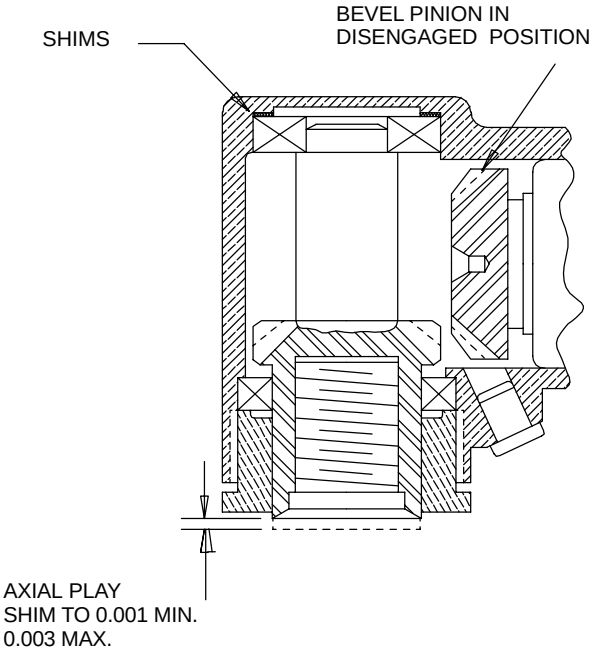
Do not get any sealant in the bearing; damage to the bearing could result.

   b. Press the Spindle Upper Bearing (105) onto the Spindle (108) and allow the sealant to dry for a minimum of 10 minutes.

NOTICE

Make sure the Bevel Pinion (108) 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" (.051 mm) from the reading for required shim thickness. (See Dwg. TPD682–1)



(Dwg. TPD682–1)

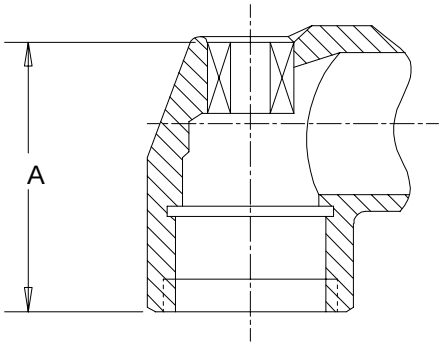
   h. Unscrew and remove the Spindle Bearing Cap. While pulling the Bevel Pinion outward toward the Bevel Pinion Bearing (109), remove the Spindle from the Angle Head.

NOTICE

Shim Packet contains three 0.002” (0.05 mm) shims and two 0.005” (.13 mm) shims.

i. Insert the required number of shims, as determined from step (g), into the upper bearing recess of the Angle Head.
Reassemble and test the Angle lead as indicated in steps (c) through (f).

j. **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 in Dwg. TPD680.



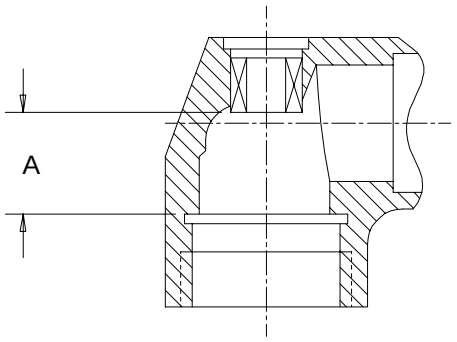
(Dwg. TPD680)

Minimum Dimension “A”		Maximum Dimension “A”	
in	**mm**	**in**	**mm**
1.21	30.75	1.27	31.25

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

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.



(Dwg. TPD636)

Minimum Dimension “A”		Maximum Dimension “A”	
in	**mm**	**in**	**mm**
0.718	18.25	0.728	18.50

10. Lubricate the Spindle Upper Bearing, Bevel Gear and Lower Spindle Bearing as instructed in **Lubrication** 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 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. 85A32–26 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 (29) 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 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 Throttle Valve 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 for about 30 seconds. **Immediately** pour 3 cc of light 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 and gearing parts. Lubricate as instructed.
	Inadequate grease	Inject 0.5 to 1.5 cc of grease into Grease Fitting (102).
	Worn or damaged parts	Clean and inspect the Angle Head and gearing. If the Bevel Gear and/or Bevel Pinion is broken, replace **both** parts as they are a matched set.

NOTICE

SAVE THESE INSTRUCTIONS. DO NOT DESTROY.

NOTES

NOTES