

OPERATION AND MAINTENANCE MANUAL FOR SERIES 3 DRILLS AND ANGLE DRILLS

Series 3 Drills and 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 1/4" (6 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.
- 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.
- The Throttle Valve Cap is under pressure from the Throttle Valve Spring. Use care when removing the Throttle Valve Cap. (On tools where applicable.)
- This tool is not designed for working in explosive atmospheres.
- This tool is not insulated against electric shock.

USING THE TOOL

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

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.

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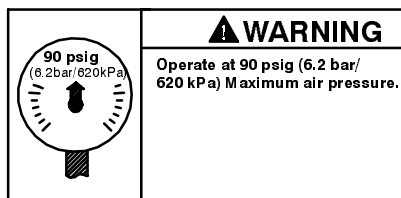
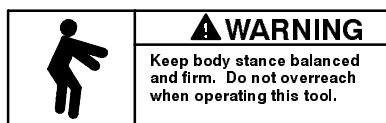
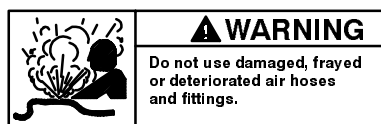
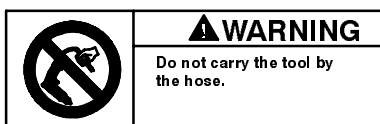
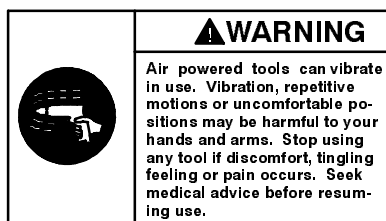
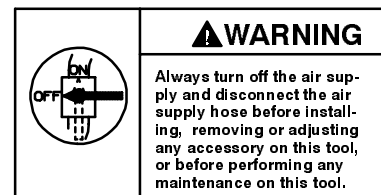
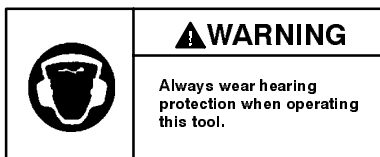
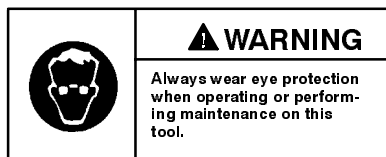
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INGERSOLL-RAND®
PROFESSIONAL TOOLS

WARNING LABEL IDENTIFICATION

⚠ WARNING

FAILURE TO OBSERVE THE FOLLOWING WARNINGS COULD RESULT IN INJURY.



PLACING TOOL IN SERVICE

LUBRICATION



Ingersoll-Rand No. 10



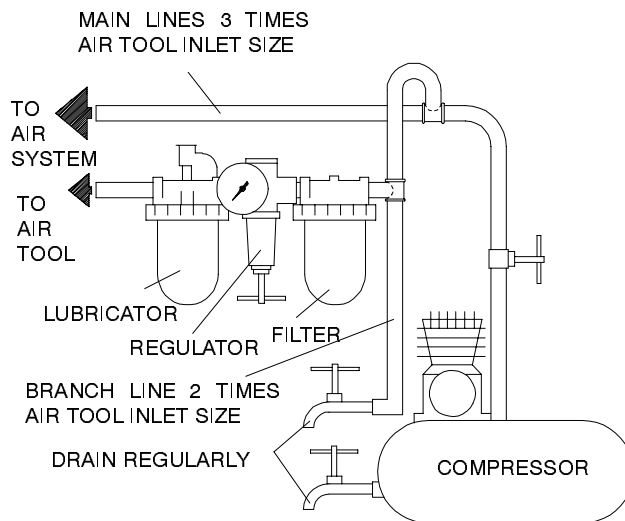
Gearing
Ingersoll-Rand No. 28
Angle Head:
Ingersoll-Rand No. 67

Always use an air line lubricator with these tools.
We recommend the following Filter-Lubricator-Regulator Unit:

For USA - No. C05-02-G00

After each 40 000 cycles or each month, whichever occurs first, lubricate the gear train with Ingersoll-Rand No. 28 Grease.

After each 40 000 cycles or each month, whichever occurs first, inject 2 to 4 cc of Ingersoll-Rand No. 67 Grease into the Grease Fitting on the Angle Attachment.



(Dwg. TPD905-1)

PLACING TOOL IN SERVICE

HOW TO ORDER A DRILL

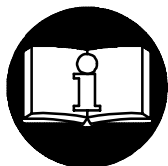
PISTOL GRIP HANDLE				IN-LINE HANDLE WITH LEVER THROTTLE AND ANGLE HEAD			
Model	Free Speed rpm	Chuck Capacity		Model	Free Speed rpm	Chuck Capacity	
		in-lb	Nm			in-lb	Nm
3AJ1	3 800	1/4	6	3LJ1A1	3 700	1/4	6
3AL1	2 800	1/4	6	3LL1A1	2 700	1/4	6
3AM1	1 650	1/4	6	IN-LINE HANDLE WITH BUTTON THROTTLE			
3AN1	1 000	1/4	6				
3AQ1	450	1/4	6	3BH1	6 000	1/4	6
IN-LINE HANDLE WITH LEVER THROTTLE				3BJ1	3 800	1/4	6
3LH1	6 000	1/4	6	3BL1	2 800	1/4	6
3LJ1	3 800	1/4	6	3BJ1A4	3 000	1/4	6
3LL1	2 800	1/4	6	3BL1A4	2 800	1/4	6

MANUEL D'EXPLOITATION ET D'ENTRETIEN DES PERCEUSES ET PERCEUSES D'ANGLE DE LA SÉRIE 3

NOTE

Les perceuses et perceuses d'angle de la Série 3 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 6 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 volatils 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 fous 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.
- Le chapeau de la soupape de commande est soumis à la pression du ressort de soupape. Prendre les soins nécessaires lors de la dépose du chapeau de soupape de commande. (Sur les outils concernés).
- 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.

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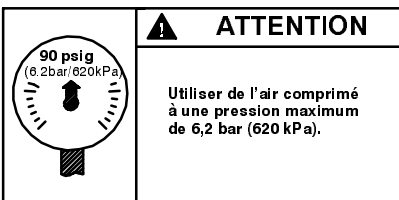
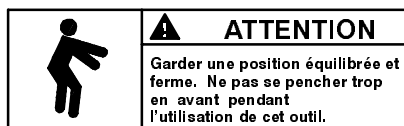
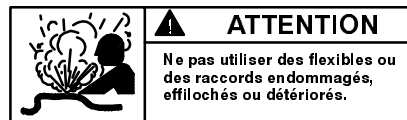
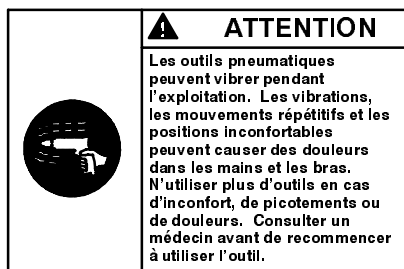
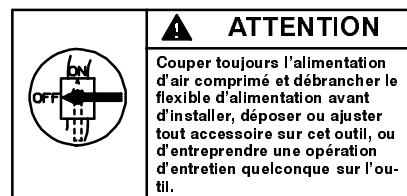
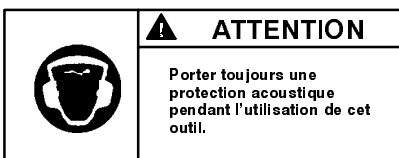
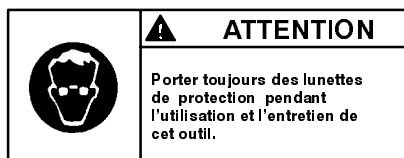
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SIGNIFICATION DES ÉTIQUETTES D'AVERTISSEMENT

⚠ ATTENTION

LE NON RESPECT DES AVERTISSEMENTS SUIVANTS PEUT CAUSER DES BLESSURES.



MISE EN SERVICE DE L'OUTIL

LUBRIFICATION



Ingersoll-Rand No. 10



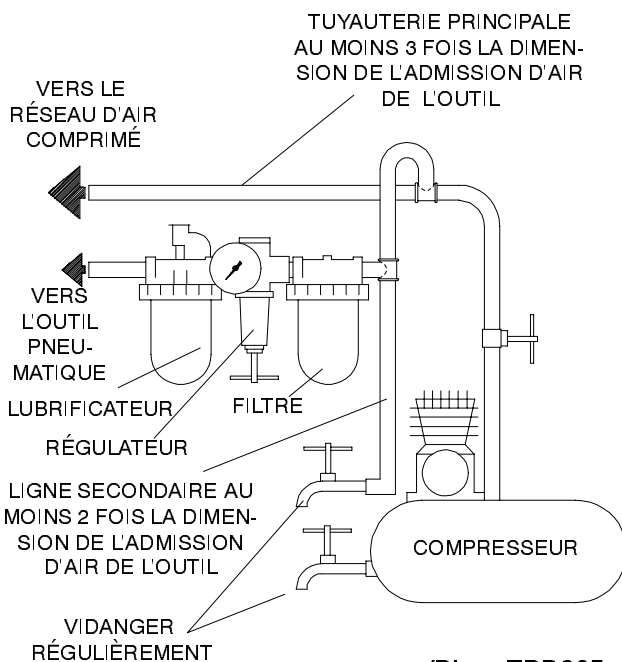
Pignonnerie
Ingersoll-Rand No. 28
Renvoi d'angle
Ingersoll-Rand No. 67

Utiliser toujours un lubrificateur avec ces outils. Nous recommandons l'emploi du filtre-régulateur-lubrificateur suivant :

For USA - No. C05-02-G00

Tous les 40 000 cycles ou au moins tous les mois, selon le cas, lubrifier le train d'engrenages avec de la graisse Ingersoll-Rand No. 28.

Tous les 40 000 cycles ou au moins tous les mois, selon le cas, injecter 2 à 4 cm³ de graisse Ingersoll Rand No. 67 dans le raccord de graissage du renvoi d'angle.



(Plan TPD905-1)

MISE EN SERVICE DE L'OUTIL

SPÉCIFICATIONS

Modèle	Poignée à levier	Capacité du mandrin		Vitesse à vide
		pouces	mm	tr/mn
3AJ1	pistolet	1/4	6	3 800
3AL1	pistolet	1/4	6	2 800
3AM1	pistolet	1/4	6	1 650
3AN1	pistolet	1/4	6	1 000
3AQ1	pistolet	1/4	6	450
3LH1	en ligne	1/4	6	6 000
3LJ1	en ligne	1/4	6	6 000
3LL1	en ligne	1/4	6	2 800
3LJ1A1	en ligne	1/4	6	3 700
3LL1A1	en ligne	1/4	6	2 700
3BH1	en ligne	1/4	6	6 000
3BJ1	en ligne	1/4	6	3 800
3BL1	en ligne	1/4	6	2 800
3BJ1A4	en ligne	1/4	6	3 000
3BL1A4	en ligne	1/4	6	2 800

MANUAL DE FUNCIONAMIENTO Y MANTENIMIENTO PARA TALADROS RECTOS Y ANGULARES DE LA SERIE 3

NOTA

Los taladros rectos y angulares de la serie 3 están diseñados para las operaciones de taladrado en la industria aeroespacial, de automoción, de electrodomésticos, electrónica, de mecanizado 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 6 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.
- El muelle de la válvula reguladora hace fuerza contra la tapa de dicha válvula. Tenga cuidado al sacar la tapa de válvula. (Si procede, según la herramienta).
- 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.

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PROFESSIONAL TOOLS

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.
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	⚠ ADVERTENCIA Usar siempre protección para los oídos al manejar esta herramienta.
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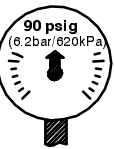
	⚠ ADVERTENCIA Cortar siempre el suministro de aire y desconectar la manguera de suministro de aire antes de instalar, retirar o ajustar cualquier accesorio de esta herramienta, o antes de realizar cualquier operación de mantenimiento de la misma.
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	⚠ 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.
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	⚠ ADVERTENCIA No coger la herramienta por la manguera para levantarla.
---	--

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

	⚠ ADVERTENCIA Mantener una postura del cuerpo equilibrada y firme. No estirar demasiado los brazos al manejar la herramienta.
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	⚠ ADVERTENCIA Manejar la herramienta a una presión de aire máxima de 90 psig (6,2 bar/620 kPa).
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PARA PONER LA HERRAMIENTA EN SERVICIO

LUBRICACIÓN



Ingersoll-Rand Nº. 10



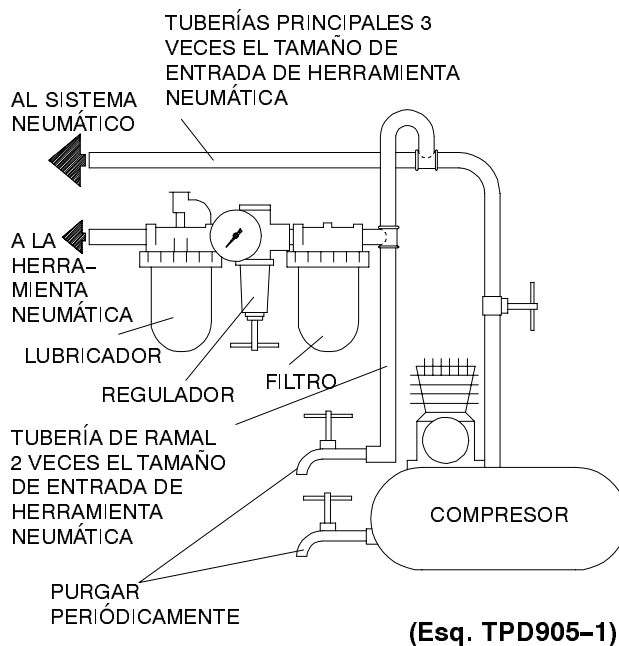
Engranajes
Ingersoll-Rand Nº. 28
Cabeza angular
Ingersoll-Rand Nº. 67

Utilice siempre un lubricador de aire comprimido con estas herramientas. Recomendamos el siguiente conjunto de filtro-lubricador-regulador:

For USA - No. C05-02-G00

Después de cada 40 000 ciclos o mensualmente, lo que ocurra primero, lubrique el tren de engranajes con grasa Ingersoll-Rand Nº. 28.

Después de cada 40 000 ciclos o cada mes de uso, lo que sea primero, inyecte 2-4 cc de grasa Ingersoll-Rand Nº. 67 en el engrasador de la cabeza angular.



PARA PONER LA HERRAMIENTA EN SERVICIO

ESPECIFICACIONES

Modelo	Tipo de empuñadura	Capacidad del portabrocas		Velocidad en vacío
		pulg.	mm	rpm
3AJ1	pistola	1/4	6	3 800
3AL1	pistola	1/4	6	2 800
3AM1	pistola	1/4	6	1 650
3AN1	pistola	1/4	6	1 000
3AQ1	pistola	1/4	6	450
3LH1	recta	1/4	6	6 000
3LJ1	recta	1/4	6	6 000
3LL1	recta	1/4	6	2 800
3LJ1A1	recta	1/4	6	3 700
3LL1A1	recta	1/4	6	2 700
3BH1	recta	1/4	6	6 000
3BJ1	recta	1/4	6	3 800
3BL1	recta	1/4	6	2 800
3BJ1A4	recta	1/4	6	3 000
3BL1A4	recta	1/4	6	2 800

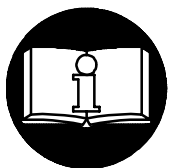
MANUAL DE FUNCIONAMENTO E MANUTENÇÃO OS BERBEQUINS ANGULARES E BERBEQUINS SÉRIES 3

AVISO

Os Berbequins Angulares e os Berbequins Séries 3 são concebidos para aplicações de em indústrias aeroespacial, automotiva, de equipamentos, electrónica, de maquinaria aeroespacial 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 SEGUINTE ADVERTÊNCIAS PODE
RESULTAR EM FERIMENTOS.**

COLOCANDO A FERRAMENTA EM FUNCIONAMENTO

- Sempre opere, inspecione 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 6 mm (1/4").
- 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 trabalhar brevemente após a pressão tenha 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.
- O Tampo da Válvula Reguladora de Pressão está sob pressão da Mola da Válvula. Tenha cuidado ao removê-lo. (*Apenas em algumas ferramentas.*)
- 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.

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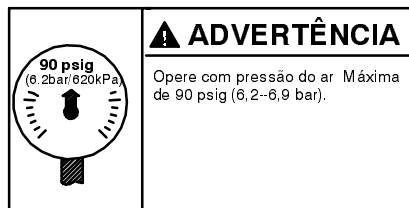
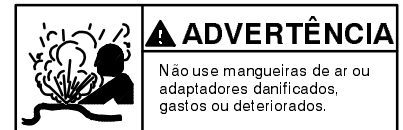
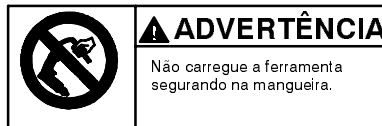
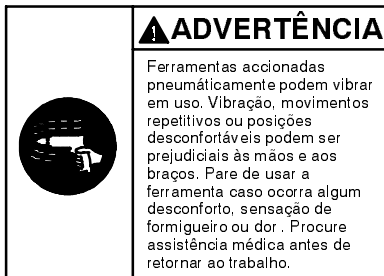
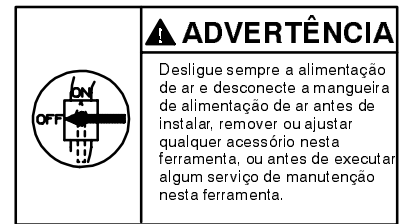
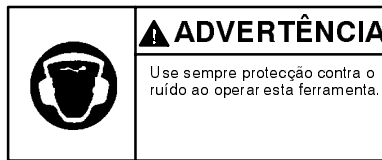
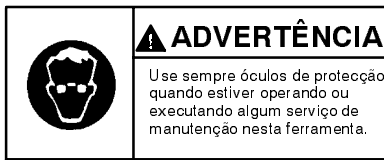
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INGERSOLL-RAND®
PROFESSIONAL TOOLS

IDENTIFICAÇÃO DO RÓTULO DE ADVERTÊNCIA

⚠ ADVERTÊNCIA

O NÃO CUMPRIMENTO DAS SEGUINTE ADVERTÊNCIAS PODE RESULTAR EM FERIMENTOS.



COLOCANDO A FERRAMENTA EM FUNCIONAMENTO

LUBRIFICAÇÃO



Ingersoll-Rand No. 10



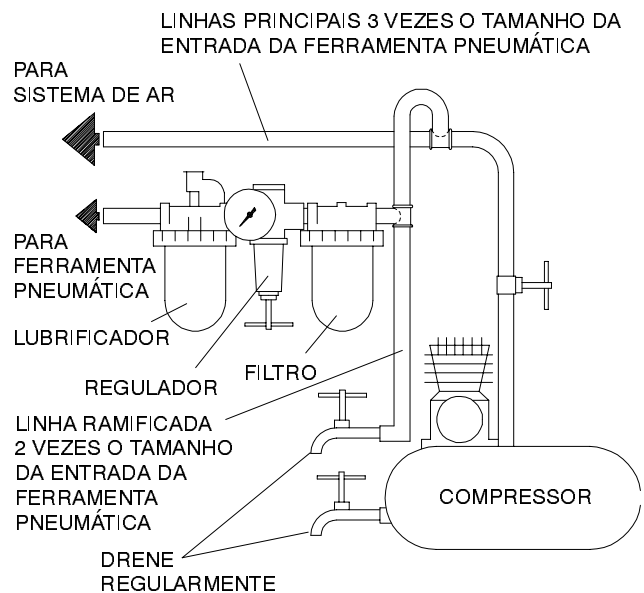
Engrenagem
Ingersoll-Rand No. 28
Acoplamento em Ângulo
Ingersoll-Rand No. 67

Use sempre um lubrificador de ar de linha com estas ferramentas. Nós recomendamos a seguinte Unidade Filtro-Lubrificador-Regulador:

For USA - No. C05-02-G00

Depois de 40 000 ciclos ou cada mês, o que ocorrer primeiro, lubrifique o trem de engrenagem com Massa Lubrificadora Ingersoll-Rand No. 28.

Depois de 40 000 ciclos ou cada mês, o que ocorrer primeiro, injecte de 2 a 4 cc de Massa Lubrificadora Ingersoll-Rand no Adaptador de Massa no Acoplamento em Ângulo.

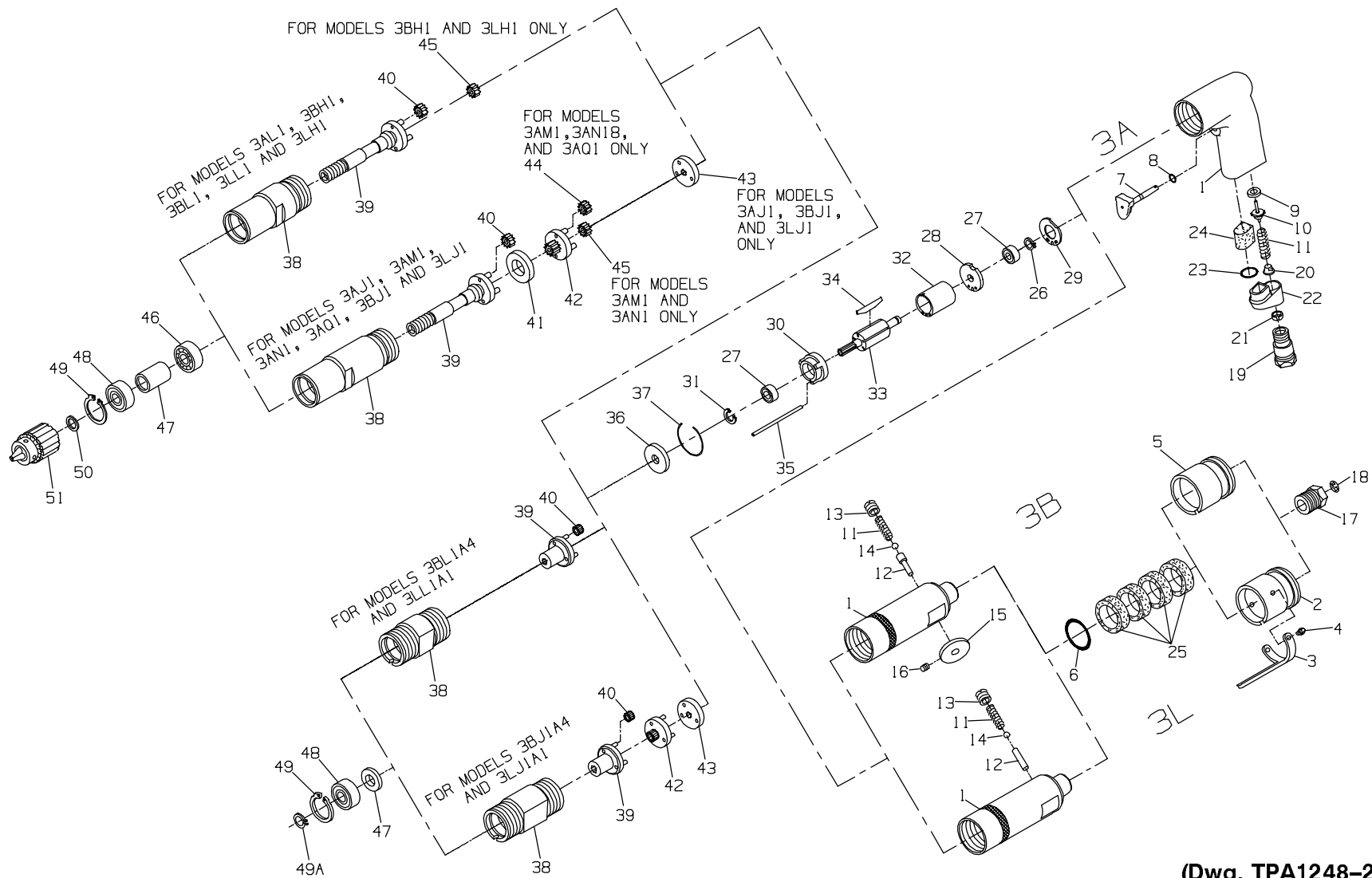


(Desenho TPD905-1)

COLOCANDO A FERRAMENTA EM FUNCIONAMENTO

ESPECIFICAÇÕES

Modelo	Tipo de Punho	Capacidade do Encabadouro		Velocidade Livre
		mm	pol.	
3AJ1	pistola	6	1/4	3 800
3AL1	pistola	6	1/4	2 800
3AM1	pistola	6	1/4	1 650
3AN1	pistola	6	1/4	1 000
3AQ1	pistola	6	1/4	450
3LH1	em linha	6	1/4	6 000
3LJ1	em linha	6	1/4	6 000
3LL1	em linha	6	1/4	2 800
3LJ1A1	em linha	6	1/4	3 700
3LL1A1	em linha	6	1/4	2 700
3BH1	em linha	6	1/4	6 000
3BJ1	em linha	6	1/4	3 800
3BL1	em linha	6	1/4	2 800
3BJ1A4	em linha	6	1/4	3 000
3BL1A4	em linha	6	1/4	2 800



(Dwg. TPA1248-2)

PART NUMBER FOR ORDERING

PART NUMBER FOR ORDERING

MAINTENANCE SECTION

1	Motor Housing Assembly		15	Throttle Button (for Model 3B)	3BL1-273
	for Model 3A	3A-A40	16	Throttle Button Screw (for Model 3B)	3BL1-561
	for Model 3A-EU	3A-EU-A40	17	Inlet Bushing Assembly	
	for Model 3B	3BL1-A40		(for Models 3B and 3L)	3RL-A465
	for Model 3B-EU	3BL1-EU-A40	• 18	Inlet Screen	
	for Model 3L	3L-A40		(for Models 3B and 3L)	3RL-61
	for Model 3L-EU	3L-EU-A40	19	Inlet Bushing (for Model 3A)	3RA-465
*	Warning Label		♦ • 20	Inlet Screen (for Model 3A)	R0A2-61
	for 3A, 3B and 3L	WARNING-7-99	21	Inlet Bushing Spacer (for Model 3A)	7AH-65
	for 3A-EU, 3B-EU and 3L-EU . . .	EU-99	22	Muffler Assembly (for Model 3A)	3RA-A123
	Exhaust Deflector Assembly		♦ • 23	Muffler O-ring (for Model 3A)	85H-167
	(for Model 3L)	3RL-A23	♦ • 24	Muffler Element (for Model 3A)	3RA-310
2	Exhaust Deflector (for Model 3L)	3RL-23	• 25	Muffler Element (4)	
3	Throttle Lever (for Model 3L)	3RL-273		(for Models 3B and 3L)	3RL-311
4	Throttle Lever Pin (2) (for Model 3L) . .	3RL-120	♦ • 26	Rear Rotor Bearing Retainer	8SL-305
5	Exhaust Deflector (for Model 3B)	3RP-23	♦ 27	Rotor Bearing (2)	DG10-22
• 6	Exhaust Deflector Seal		28	Rear End Plate	3RL-12
	(for Models 3B and 3L)	3RL-210	♦ • 29	Rear End Plate Gasket	3RL-739
7	Trigger Assembly (for Model 3A)	3RA-A93	30	Front End Plate	3RL-11
♦ • 8	Trigger Pin Seal (for Model 3A)	8SL-259	♦ • 31	Front Rotor Bearing Retainer	3RL-13
♦ • 9	Throttle Valve Seat (for Model 3A)	7AH-303	32	Cylinder	3RL-3
♦ • 10	Throttle Valve (for Model 3A)	7AH-302	33	Rotor	3RL-53
♦ • 11	Throttle Valve Spring		♦ • 34	Vane Packet (set of 5 Vanes)	3RL-42-5
	for Model 3A	3RA-51	35	Cylinder Dowel	3RL-98
	for Models 3B and 3L	3RL-51	36	Motor Clamp Washer	3RL-207
12	Throttle Valve Plunger		37	Clamp Washer Retaining Ring	3RL-208
	for Model 3B	3BL1-302			
	for Model 3L	3RL-302			
13	Throttle Valve Cap				
	(for Models 3B and 3L)	3RL-266			
14	Throttle Valve Ball				
	(for Models 3B and 3L)	4U-722			

* Not illustrated.

♦ Indicates Tune-up Kit Part.

• 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

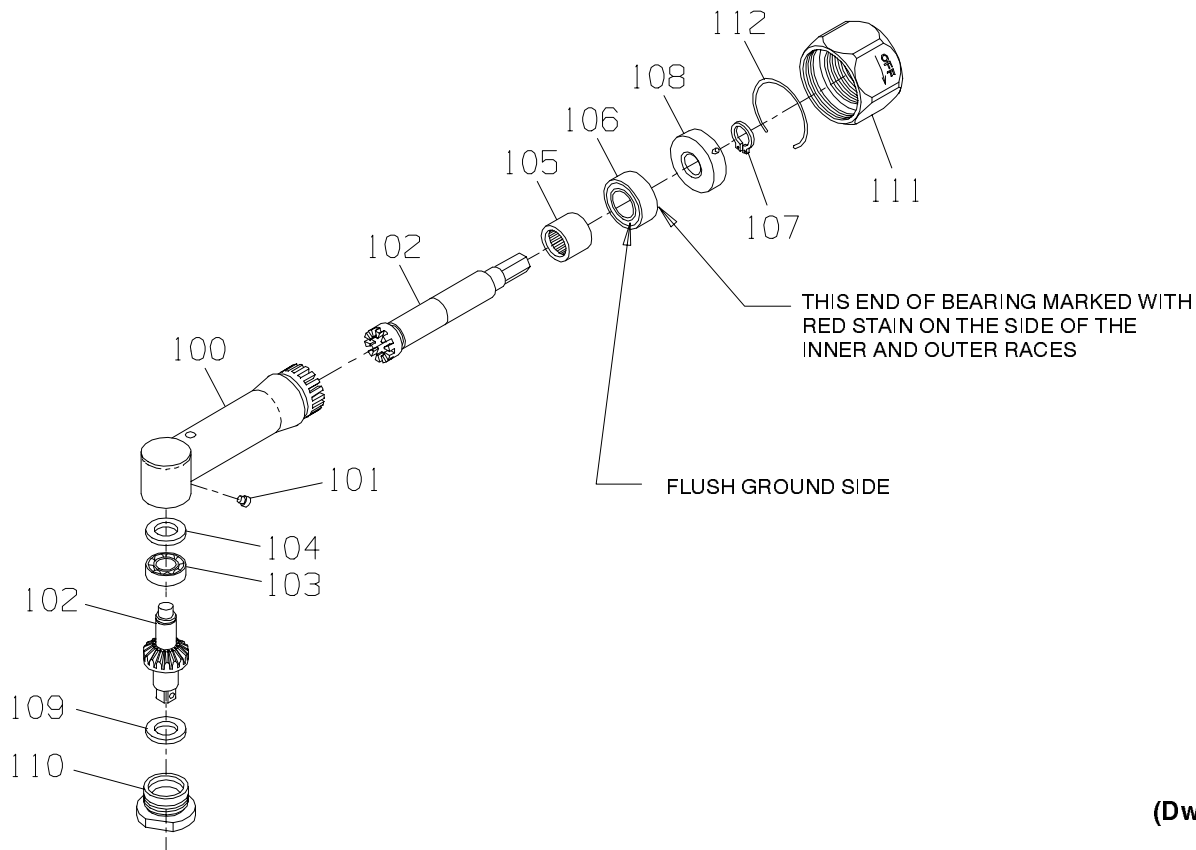
PART NUMBER FOR ORDERING

MAINTENANCE SECTION

38	Gear Case for Models 3AL1, 3BH1, 3BL1, 3LL1 and 3LH1 for Models 3AJ1, 3AM1, 3AN1, 3AQ1, 3BJ1 and 3LJ1 for Models 3BL1A4 and 3LL1A1 for Models 3BJ1A4 and 3LJ1A1	3AL-37 3AM-37 3RLL-37 3RLM-37	45	Rotor Pinion (for Models 3AM1, 3AN1, 3BH1 and 3LH1)	3RLM-17
39	Spindle for Models 3BH1 or 3LH1 for Models 3AL1, 3BL1 and 3LL1 for Model 3AM1 for Models 3AJ1, 3AN1, 3AQ1, 3BJ1 and 3LJ1 for Models 3BL1A4 and 3LL1A1 for Models 3BJ1A4 and 3LJ1A1	3AH-8 3AL-8 3AM-8 3AN-8 3RLL-108 3RLN-108	46	Rear Spindle Bearing (for Models 3AJ1, 3AL1, 3AM1, 3AN1, 3AQ1, 3BH1, 3BJ1, 3BL1, 3LL1, 3LH1 and 3LJ1)	R00H-97
40	Spindle Planet Gear (3) for Models 3AL1, 3BL1, 3BL1A4 3LL1 and 3LL1A1 for Models 3AM1, 3BH1 and 3LH1 for Models 3AJ1, 3AN1, 3AQ1, 3BJ1, 3BJ1A4, 3LJ1 and 3LJ1A1	3RLL-10 3RLM-10 3RLN-10	47	Spindle Bearing Spacer for Models 3AJ1, 3AL1, 3AM1, 3AN1, 3AQ1, 3BH1, 3BJ1, 3BL1, 3LL1, 3LH1 and 3LJ1 for Models 3BJ1A4, 3BL1A4, 3LJ1A1 and 3LL1A1	3A-111A 3RL-80 R00A-510
41	Gear Head Spacer (for Models 3AJ1, 3AM1, 3AN1, 3AQ1, 3BJ1 and 3LJ1)	3RL-80	48	Front Spindle Bearing	
42	Gear Head for Model 3AM1 for Models 3AJ1, 3AN1, 3BJ1, 3BJ1A4, 3LJ1 and 3LJ1A1 for Model 3AQ1	3RLM-216 3RLN-216 M002-216-044	49	Spindle Bearing Retainer for Models 3AJ1, 3AL1, 3AM1, 3AN1, 3AQ1, 3BH1, 3BJ1, 3BL1, 3LL1, 3LH1 and 3LJ for Models 3BJ1A4, 3BL1A4, 3LJ1A1 and 3LL1A1	3RANT2-28 3RL-28
43	Drive Plate (for Models 3AJ1, 3BJ1, 3BJ1A4, 3LJ1 and 3LJ1A1)	M002-171	49A	Spindle Retaining Ring (for Models 3BJ1A4, 3RL1A4, 3LJ1A1 and 3LL1A1)	3RL-6
44	Gear Head Planet Gear (3) for Models 3AM1 and 3AN1 for Model 3AQ1	3RLM-10 3RLL-10	50	Drill Chuck Spacer (for Models 3AJ1, 3AL1, 3AM1, 3AN1, 3AQ1, 3BH1, 3BJ1, 3BL1, 3LL1, 3LH1 and 3LJ1)	5A-90
			51	Drill Chuck (for Models 3AJ1, 3AL1, 3AM1, 3AN1, 3AQ1, 3BH1, 3BJ1, 3BL1, 3LL1, 3LH1 and 3LJ1)	R0H-99
			*	Chuck Key	R1H-J253
			*	Horizontal Hanger	3RA-365
			*	Tune-up Kit (includes illustrated parts 8, 9, 10, 11, 20, 23, 24, 26, 27 [2], 29, 31 and 34)	3A-TK2

* Not illustrated.

MAINTENANCE SECTION



(Dwg. TPC525)

PART NUMBER FOR ORDERING

		↓	↓
		3RL1A1	3RL1A4
	Angle Attachment	3RL1A1	3RL1A4
100	Angle Housing	3RL1A-550	3RL1A-550
101	Grease Fitting	D0F9-879	D0F9-879
102	Matched Bevel Gear Set (Bevel Pinion and Spindle not sold separately)	3RL1A-A591	3RL1A4-A591
103	Spindle Upper Bearing	7L1A-603	7L1A-603
104	Upper Bearing Shim Packet	7L1A-P448	7L1A-P448
105	Bevel Pinion Bearing	7AH-24	7AH-24
106	Bevel Pinion Thrust Bearing	3RL1A-514	3RL1A-514
107	Thrust Bearing Retainer	3RL2-705	3RL2-705
108	Rear Thrust Bearing Seat Assembly (Includes Rear Bearing Seat and Lock Pin)	3RL1A-682	3RL1A-682
109	Lower Spindle Bearing	7L1A-593	7L1A-593
110	Spindle Bearing Cap	7L1A-A531	7L1A-531
111	Coupling Nut	3RL2-27	3RL2-27
112	Coupling Nut Retainer	3RL2-29	3RL2-29

MAINTENANCE SECTION

WARNING

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

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.

LUBRICATION

Each time a Series 3 Drill or Angle Drill is disassembled for maintenance and repair or replacement of parts, lubricate the tool as follows:

1. Gearing

For L ratio, coat gears with 2 to 4 cc of Ingersoll-Rand No. 28 Grease.

For M, N, P or Q ratios, coat gears with 4 to 6 cc of Ingersoll-Rand No. 28 Grease.

2. Angle Head

Inject 2 to 4 cc of Ingersoll-Rand No. 67 Grease into the Grease Fitting (101).

- 3 Use Ingersoll-Rand No. 10 Oil for lubricating the motor. Inject approximately 1 to 2 cc of oil into the air inlet before attaching the air hose.

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 Tool

1. Each Series 3 Drill is comprised of three modules or units. Drills with model numbers ending in **H1**, **J1**, **L1** or **Q1** have a motor housing and motor unit, a gear unit and a drill chuck spindle unit. Drills with model numbers ending in **L1A1** and **L1A4** have a motor housing and motor unit, a gear unit and an angle attachment unit. The tool can be disassembled for repairs to each individual unit without disturbing the other units.

2. **For Models 3AJ1, 3AL1, 3AM1, 3AN1, 3AQ1, 3BH1, 3BJ1, 3BL1, 3LH1, 3LJ1 and 3LL1**, to remove Drill Chuck (51), lightly grasp the tool in a copper-covered vise using the flats on the Gear Case (38). Insert the Chuck Key into one of the holes in the Chuck and tap lightly with a hammer. Remove the Drill Chuck Spacer (50).
3. **For Models 3BJ1A4, 3BL1A4, 3LJ1A1 and 3LL1A1**, to remove the Angle Attachment, use two wrenches to unscrew the Coupling Nut (111) from the Gear Case and lift off the entire angle attachment.
4. Using two wrenches, unscrew and remove the Gear Case from the Motor Housing (1).

Disassembly of the Angle Attachment

1. Carefully grasp the Angle Head in copper-covered vise jaws so that the Spindle is facing upward.
2. Using a wrench, remove the Spindle Bearing Cap (110).

NOTICE

This is a left-hand thread.

- Do not remove the Spindle (102) from the Angle Head until the Bevel Pinion (102) is pulled outward against the Bevel Pinion Thrust Bearing (106). Failure to do so could damage the Spindle Upper Bearing (103), making it impossible to remove the Bearing from the Spindle. Also, the Bevel Pinion could be damaged. If tightness or binding occurs, check to make sure the Bevel Pinion has been pulled outward.
3. Pull the Spindle from the Angle Head.
 4. Inspect the lower Spindle Bearing (109) for looseness or roughness. If either of these conditions exists, press the Bearing from the Spindle.
 5. If the Spindle Upper Bearing (103) appears rough or loose, press it off the Spindle.
 6. Remove the Thrust Bearing Retainer (107), Rear Thrust Bearing Seat (108) and Bevel Pinion Thrust Bearing (106) from the Bevel Pinion (102) shaft.
 7. Grasp the spline of the Bevel Pinion shaft in leather-covered or copper-covered vise jaws. While pulling on the Angle Head, tap the rear face of the Angle Housing with a soft hammer to pull the Bevel Pinion and Bevel Pinion Bearing (105) from the Angle Housing.

NOTICE

Do not remove the Bevel Pinion shaft and Bevel Pinion Bearing unless you have a new Bearing on hand.

After the Angle Head is disassembled, check all parts for damage or wear.

MAINTENANCE SECTION

8. If the gear teeth on either the Spindle or Bevel Pinion are worn or chipped, replace both parts.

NOTICE

These gear sets are furnished in a matched set and must be replaced as a matched set.

Disassembly of Gearing

1. Using a thin blade screwdriver, work the Motor Clamp Washer Retaining Ring (37) from the groove in the Gear Case and withdraw the Motor Clamp Washer (36).
2. **For Models 3AJ1, 3AM1, 3AN1, 3AQ1, 3BJ1, 3BJ1A4 and 3LJ1A1**, tap the motor end of the Gear Case against the top of the workbench to remove the Gear Head (42), Gear Head Spacer (41), Drive Plate (43) or Gear Head Planet Gears (44). **For 3BH1 and 3LH1**, remove the Rotor Pinion (45).
3. **For Models 3BJ1A4, 3BL1A4, 3LJ1A1 and 3LL1A1**, using pair of snap ring pliers, remove the Spindle Retaining Ring (49A) from the groove in the front of the Spindle.
4. To remove the Spindle (39) and Spindle Planet Gears (40), firmly hold the Gear Case and tap the threaded end of the Spindle with a soft-faced hammer, driving the Spindle from the Gear Case.
5. Use snap ring pliers to remove the Spindle Bearing Retainer (49) from the groove in the front of the Gear Case.
6. Using a sleeve that contacts the outer ring of the bearing, press the Rear Spindle Bearing (46) from the front of the Gear Case.

Disassembly of the Motor

1. Grasp the splined end of the Rotor (33) and pull the motor from the Motor Housing (1).
2. Withdraw the Rear End Plate Gasket (29) from the bottom of the housing bore.
3. While grasping the Cylinder (32) in one hand, lightly tap on the splined end of the Rotor to drive the Rotor from the bore of the Front Rotor Bearing (27), thus freeing the Front End Plate (30) and Bearing.
4. Using snap ring pliers, remove the Front Rotor Bearing Retainer (31) and pull the Front Rotor Bearing from the Front End Plate.
5. Slide the Cylinder off the Rotor, and withdraw the Vanes (34) from the vane slots.
6. Remove the Rear Rotor Bearing Retainer (26) from the groove in the hub of the Rotor.
7. Support the Rear End Plate (28) as close to the rotor body as possible, and press the Rotor from the Rear Rotor Bearing.

Disassembly of the Motor Housing

For Pistol Grip (Model 3A)

1. Lightly grasp the pistol grip handle in copper-covered vise jaws so that the Air Inlet Bushing (19) is upward.
2. Unscrew the Air Inlet Bushing and remove the Inlet Bushing Spacer (21), Muffler Assembly (22), Muffler O-ring (23), Air Strainer Screen (20), Throttle Valve Spring (11) and Throttle Valve (10).
3. Withdraw the Trigger (7) and Trigger Pin Seal (8).
4. Using a stiff wire hook, pull the Throttle Valve Seat (9) from the handle.
5. Using a pair of needle-nose pliers, pull the Muffler Element (24) from the handle.

Disassembly of the Motor Housing

For In-Line (Models 3B and 3L)

1. **For Model 3B**, loosen the Throttle Button Screw (16) and remove the Throttle Button (15) from the Throttle Valve Plunger.

⚠ WARNING

The Throttle Valve Cap is under pressure from the Throttle Valve Spring and care must be exercised when removing the Throttle Valve Cap.

2. Remove the Throttle Valve Cap (13), Throttle Valve Spring (11), Throttle Valve Ball (14) and Throttle Valve Plunger (12) from the Motor Housing (1).
3. Using an adjustable wrench, remove the Inlet Bushing Assembly (17).
4. If the Inlet Screen (18) requires replacement, use the eraser end of a wooden pencil to push the Inlet Screen from the Inlet Bushing Assembly.
5. **For Model 3B**, remove the Exhaust Deflector (5) from the Motor Housing.
For Model 3L, remove the Exhaust Deflector Assembly (2) from the Motor Housing.
6. Remove the Exhaust Deflector Seal (6) from the Housing.
7. **For Model 3L**, the Throttle Lever (3) is attached to the Exhaust Deflector Assembly with two Throttle Lever Pins (4) which are two-piece rivets. Lightly grasping the Deflector in copper-covered vise jaws, drive the pin in the center of the rivet inward with a pin punch until it is free of the rivet. Repeat the procedure on the other rivet. Squeeze the ends of the rivets together and pry them from the Deflector with a screwdriver or pull them with pliers.
8. Work the Muffler Elements out of the Exhaust Deflector.

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.

MAINTENANCE SECTION

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. Apply a film of O-ring lubricant to all O-rings before final assembly.
6. 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 bearings should never be cleaned.** Work grease thoroughly into every open bearing before installation.

Assembly of the Motor Housing

For Pistol Grip (Model 3A)

1. Grasp the handle in a vise so that the handle is vertical and the entrance to the handle bore is upward.
2. Note that the Throttle Valve Seat (9) is symmetrical and can be installed in the handle either side first in order to get full use of each side. Push the Throttle Valve Seat into the tapped bore of the handle with a 1/2" (13 mm) diameter dowel. Push it in until it seats.
3. Install the Trigger Pin Seal (8) onto the trigger pin and insert Trigger (7) In the Housing.
4. Installation of the Throttle Valve is sometimes a bit difficult due to the smallness of the Valve and the depth of the bore in which it is located. The difficult part is in holding the Valve while inserting the long end of the valve stem through the hole In the trigger pin. Although the Valve can be held with a push-button mechanical pencil or a wooden dowel, one of the easiest ways to hold it is by using a common wooden pencil with rubber eraser. Insert the short end of the valve stem into the rubber eraser full depth, then backing it out far enough so that the Valve is just nicely supported. Insert the Valve into the bore of the handle so that the long end of the stem enters the hole in the trigger stem. Pull outward on the Trigger to hold the Valve while removing the pencil.
5. Place the Air Strainer Screen (20), closed end first, inside the large end coil of the Throttle Valve Spring (11).
6. Insert the Throttle Valve Spring and Screen, small coil first, into the handle so that the Spring encircles the end of the Throttle Valve.
7. If the Muffler Element (24) was removed from the handle, wash it in a clean, suitable, cleaning solution and then fold it and pinch it dry. While keeping it folded, insert it into the exhaust cavity in the handle.
8. Place the Muffler O-ring (23) over the perforated baffle of the Muffler (22).
9. Place the Muffler on the face of the handle so that the perforated baffle extends into the handle.
10. Slide the Inlet Bushing Spacer (21) over the threaded end of the Inlet Bushing (19), and install the Inlet Bushing in the handle. Tighten it to 26 ft-lb (35 Nm) of torque.

Assembly of the Motor Housing

For In-Line (Models 3B and 3L)

1. Work new Muffler Elements (25) into the Exhaust Deflector (2) or (5) to a point beyond the two throttle lever pin holes.
2. **For Model 3L**, position the Throttle Lever (3) on the Exhaust Deflector with the Lever covering the timing notch at the front end of the Deflector. Insert the two Throttle Lever Pins (4) through the Lever and into the Exhaust Deflector. Using pliers, press the pins in the center of the Throttle Lever Pins flush with the head.

NOTICE

Do not apply a force strong enough to distort the Exhaust Deflector.

3. Center a new Inlet Screen (18) over the air line end of the Inlet Bushing Assembly (17) and, using the eraser end of a wooden pencil, push the Screen into the Bushing until it bottoms on the internal shoulder.
4. Place the Exhaust Deflector Seal (6) on the smaller shoulder of the Motor Housing. To hold the Seal in position, lightly coat the Seal and shoulder with Ingersoll-Rand No. 28 Grease. Place the Exhaust Deflector on the rear of the Housing, aligning the notch in the Deflector with the alignment pin in the Housing. Secure the Deflector to the Housing with the Inlet Bushing Assembly. Use a torque wrench and tighten the Inlet Bushing Assembly to 15 to 18 ft-lb (20 to 24 Nm) torque.
5. Before installing throttle components, make sure that the Motor Housing is positioned correctly.

For Model 3L, the Throttle Lever should be facing downward.

For Model 3B, the throttle valve plunger hole should be facing down. Insert the Throttle Valve Plunger (12), Throttle Valve Ball (14) and Throttle Valve Spring (11) into the Motor Housing. Position the Throttle Valve Cap (13) on the Throttle Valve Spring. Screw the Valve Cap into the Motor Housing until the cap is within approximately two threads of being flush with the Housing. Apply a light, uniform coat of Loctite®* No. 290 to the remaining two threads. Tighten the Valve Cap securely and place the Housing on a workbench with the Valve Cap facing downward. Allow the Loctite to cure approximately five minutes.

* Registered trademark of Loctite corporation.

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6. **For Model 3B**, install the Throttle Button (15) on the Throttle Valve Plunger and tighten the Throttle Button Screw (16).

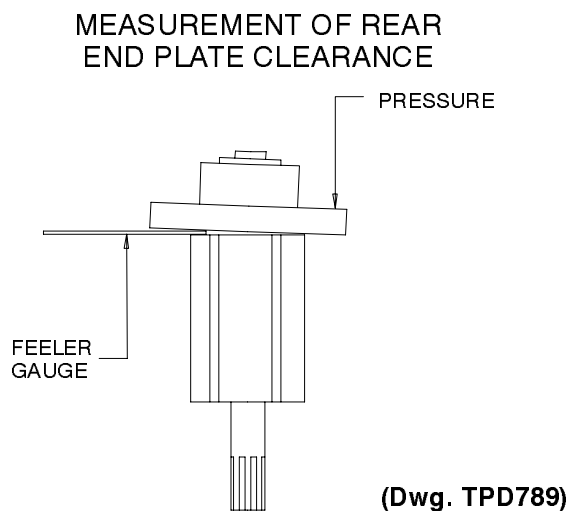
Assembly of the Motor

1. Place the Rear End Plate (28) on the short, unsplined shaft of the Rotor (33) with the counterbore away from the body of the Rotor.
2. Using a sleeve that contacts the inner ring of the Rear Rotor Bearing (27), press the Bearing onto the shaft until the Rear End Plate just contacts the rotor body.
3. The clearance between the Rear End Plate and Rotor is critical. **While pressing down** with your finger on the outer edge of the End Plate on the Bearing side, insert a .002" (.05 mm) feeler gauge between the face of the Rotor and End Plate directly opposite the point where pressure is applied.

NOTICE

This measurement must be made at the outside diameter of the rotor body.

Supporting the End Plate, lightly tap the shaft with a plastic hammer to increase the space. Press the Bearing farther onto the shaft if the space is too wide. When the proper clearance is obtained, install the Rear Rotor Bearing Retainer (26) on the shaft.



4. Place the Rotor, with the splined end up, in a block which has clearance for the Rotor Bearing and supports the Rear End Plate.
5. Wipe each Vane (34) with a light film of Ingersoll-Rand No. 10 oil and place a Vane in each slot in the Rotor.
6. Note that the Cylinder (32) has a notch in one end. Place the Cylinder, notched end up, down over the Rotor and against the Rear End Plate, aligning the dowel hole in the Cylinder with the U-shaped notch in the rim of the Rear End Plate.

7. Install the Front Rotor Bearing (27) in the Front End Plate (30) and retain it with the Front Rotor Bearing Retainer (31).
8. Using a sleeve that contacts the inner ring of the bearing, press the assembled Front End Plate, flat side first, on the splined end of the Rotor until the End Plate just contacts the Cylinder.
9. Install the Rear End Plate Gasket (29) in the Motor Housing, aligning the small notch in the Gasket with the dowel pin hole in the Housing.
10. Insert a thin, rigid wire into the dowel pin hole at the bottom of the motor recess in the Motor Housing. Grasping the assembled motor by the spline on the Rotor and with the dowel pin holes of the Front End Plate and Cylinder aligned with the U-shaped notch in the Rear End Plate, install the assembled motor in the Motor Housing. Maintain alignment between the motor and Motor Housing by passing the aligned dowel holes in the assembled motor over the wire positioned in the Motor Housing. Withdraw the wire and install the Cylinder Dowel (35), making certain the Cylinder Dowel is flush with or below the Front End Plate.

Assembly of the Gearing

For Models 3AJ1, 3AL1, 3AM1, 3AN1, 3AQ1, 3BH1, 3BL1, 3LH1, 3LJ1 and 3LL1

1. Set the Gear Case (38) on the table of an arbor press with the threaded end down.
2. Using a sleeve that will contact the outer ring of the bearing, press the Rear Spindle Bearing (46), open side first, into the bearing recess until it seats.
3. Work some grease into the teeth of the Spindle Planet Gears (40) and onto the planet gear shafts on the Spindle (39).
4. Slide the Spindle into the Gear Case so that the spindle shaft passes through the bore of the Rear Spindle Bearing.
5. Install the Spindle Retaining Ring (49A) into groove on the Spindle shaft.
6. Install the Spindle Bearing Spacer (47) and Front Spindle Bearing (48), shielded side out, on the shaft of the Spindle.
7. Install the Spindle Bearing Retainer (49) in the groove in the Gear Case.
8. Slide the Spindle Planet Gears onto the planet gear shafts, making certain the teeth on the Gears mesh with the teeth of the Gear Case.
9. **For Models 3BH1 and 3LH1**, work some grease into the teeth of the Rotor Pinion (45). Place the Rotor Pinion in the Spindle so that it meshes with the Spindle Planet Gear.

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10. **For Models 3AJ1, 3AM1, 3AN1, 3AQ1, 3BJ1 and 3LJ1**, coat the Gear Head Spacer (41) with grease and place it in the Gear Case against the Spindle Planet Gears.
11. **For Models 3AJ1, 3AM1, 3AN1, 3AQ1, 3BJ1 and 3LJ1**, work some grease onto the planet gear shafts on the Gear Head (42). **For Model 3AQ1**, work some grease into the teeth of the Gear Head Planet Gears (44).
12. **For Models 3AJ1, 3AM1, 3AN1, 3AQ1, 3BJ1 and 3LJ1**, slide the Gear Head into the Gear Case so that the teeth on the gear head shaft mesh with the Spindle Planet Gears.
13. **For Models 3AM1, 3AN1 and 3AQ1**, slide the Gear Head Planet Gears onto the planet gear shafts, making certain the teeth on the Planet Gears mesh with the teeth in the Gear Case.
14. **For Models 3AJ1, 3BJ1 and 3LJ1**, slide the Drive Plate (43) on the planet gear shafts of the Gear Head.
15. **For Models 3AM1 and 3AN1**, work some grease into the teeth of the Rotor Pinion (45) and place the Rotor Pinion in the Gear Head so that it meshes with the Gear Head Planet Gears.
16. Place the Motor Clamp Washer (36) into the Gear Case and install the Clamp Washer Retaining Ring (37).

For Models 3BL1A4, 3LL1A1, 3BJ1A4 and 3LJ1A1

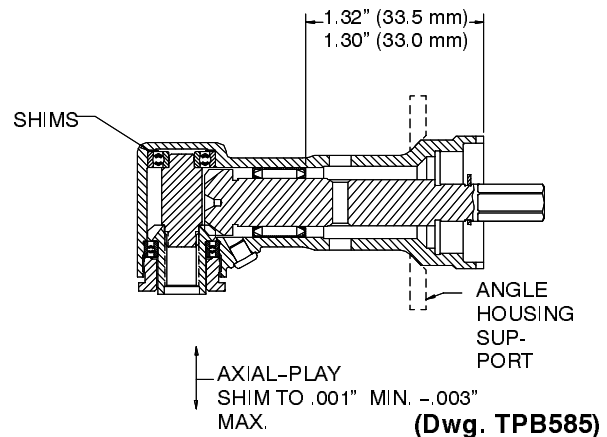
1. Hold the Gear Case (38) with the notched end upward.
2. Slide the Spindle Bearing (48), open side first, into the Gear Case until it seats against the bearing recess.
3. Install the Spindle Bearing Retainer in the groove in the Gear Case.
4. Work some grease into the teeth of the Spindle Planet Gears (40) and into the planet gear shafts of the Spindle (39).
5. Slide the Spindle Bearing Spacer (47) over the shaft of the Spindle.
6. Slide the Spindle into the Gear Case so that the spindle shaft passes through the bore of the bearing.
7. Slide the Spindle Planet Gears onto the planet gear shafts, making certain the teeth on the Gears mesh with the teeth of the Gear Case.
8. **For Models 3BJ1A4 and 3LJ1A1**, put some grease on the planet gear shafts and slide the Gear Head (42) into the Gear Case so that the teeth on the gear head shaft mesh with the Spindle Planet Gears.
9. **For Models 3BJ1A4 and 3LJ1A1**, slide the Drive Plate (43) onto the planet gear shafts of the Gear Head.

For all Models

1. Place the Motor Clamp Washer (36) in the Gear Case against the internal gear. Install the Clamp Washer Retaining Ring (37).

Assembly of the Angle Attachment

1. Work a light coat of grease into the gear teeth of the Bevel Pinion (102) and insert it, gear end first, into the long bore of the Angle Housing (100).
2. Work 0.5 to 1 cc of grease into the Bevel Pinion Bearing (105) and insert it, unstamped end first, into the bore of the Angle Housing, after the Bevel Pinion.
3. Support the Angle Housing on an angled support as shown below. Use a bearing inserting tool and press the Bevel Pinion Bearing so the face is a maximum of 1.32" (33.50 mm) but not less than 1.30" (33.00 mm) below the end face of the Angle Head. Refer to Dwg. TPB585.
4. Lubricate the Bevel Pinion Thrust Bearing (106) with 0.5 to 1 cc of grease. Install the Bearing on the rear of the bevel pinion shaft with red-stained end of Bearing toward the rear of the Angle Head. Refer to illustration below. Secure Bearing on shaft with Thrust Bearing Retainer (107).



5. Apply a small drop of Loctite No. 601 to the small outside diameter of the spindle upper bearing shaft on the Spindle (102).
6. Apply 2 to 4 cc of grease to the Spindle Upper Bearing (103) and a light coat of grease to the gear teeth on the Spindle. Press the Spindle Upper Bearing onto the Spindle and allow the Loctite to dry a minimum of ten minutes.

NOTICE

Do not get any Loctite in the bearing; damage to the Bearing could result. Do not get any on the inside diameter of the Bearing; grease will prevent the Loctite from working.

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7. Insert the Spindle into the Angle Head until the Spindle Upper Bearing seats into the recess of the Angle Head.

NOTICE

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

8. Slip the Lower Spindle Bearing over the end of the Spindle and into the angle head recess.
9. Install the Spindle Bearing Cap (110) finger tight.
10. Spindle must turn freely.
11. While holding the Bevel Pinion out of engagement with the Spindle, measure the amount of end play in the Spindle. Subtract .002" (.051 mm) from the reading to determine the required shim thickness.
12. Unscrew and remove the Spindle Bearing Cap. While pulling the Bevel Pinion outward toward the Bevel Pinion Bearing, remove the Spindle from the Angle Head.
13. Insert the required number of shims, as determined in step (11) into the upper bearing recess of the Angle Head.

NOTICE

Shim Packet contains three .002" (.05 mm) shims and two .005" (.13 mm) shims.

14. Reassemble and test the Angle Head as indicated in steps (6) through (12).
15. Once proper shimming has been achieved, remove the Angle Housing Cap, clean the threads on the Angle Head and the Angle Housing Cap, and apply a film of Vibra-Tite®** VC3 to the threads.
16. Install the Angle Housing Cap and tighten to 35 in-lb (3.9 Nm) torque.

17. Install the Rear Thrust Bearing Seat (108) on the bevel pinion shaft with the flat face against the Thrust Bearing.
18. Slide the Coupling Nut Retainer (112) and the Coupling Nut (111), threaded end trailing, over the notched end of the Angle Housing.
19. Compress the Coupling Nut Retainer, and work it into the internal groove in the unthreaded end of the Coupling Nut.

Assembly of the Tool

1. Apply some grease to the spline of the rotor shaft and screw the Gear Case and components into the Motor Housing. Tighten to 15 to 18 ft-lb (20 to 25 Nm) torque.

NOTICE

This is a left-hand thread.

2. **For Models 3BL1A4, 3LL1A1, 3BJ1A4 and 3LJ1A1**, align the pin in the Rear Thrust Bearing Seat with the notch in the Gear Case (38) and screw the Coupling Nut onto the Gear Case. Tighten to 18.4 to 22.1 ft-lb (25 to 30 Nm) of torque.

NOTICE

This is a left-hand thread.

3. **For all other models**, slide the Drill Chuck Spacer (50) over the threaded end of the Drill Chuck Spindle and install the Drill Chuck (51).

** Registered trademark of ND Industries.

MAINTENANCE SECTION

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 Inlet Screen	Clean the Air Strainer or 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 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 parts. Lubricate as instructed.
	Inadequate grease	Inject 0.5 to 1.5 cc of the recommended 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.