

NPR (Nippon Piston Ring) Piston Rings.

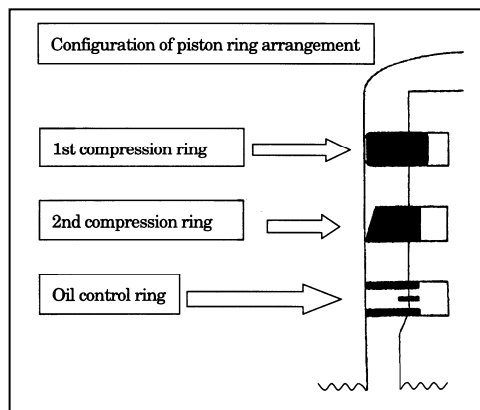
1. The most important functions of NPR Piston Rings.

NPR's most important principles of Piston Rings are:

- a. Function (Reliability).
- b. Reduced Weight.
- c. Low Friction.
- d. Low Production Cost.

Functions of each 1st, 2nd, and Oil Control Rings (please see below figures):

Function \ Type	1st compression ring	2nd compression ring	Oil control ring
Gas seal	⊙	○	—
Oil control	○	⊙	⊙
Heat conduction	⊙	○	—
Bearings	⊙	○	○



1) Gas Seal:

The seal must perform during both the compression stroke and expansion stroke to provide maximum performance. This is best achieved with the proper amount of lubricant oil film on the piston ring cylinder contact point and complete contact of the bottom of the piston ring against the piston groove. Therefore, the proper seal improves performance and decreases oil consumption.

2) Oil Control:

The function of the oil control ring is to assure the proper amount of lubricant film. By providing the correct lubricant film for all piston ring contact points on the cylinder, this will prevent scuffing and excessive wear. However, an excessive amount of lubricant film will force too much oil into the combustion chamber resulting in soot in the exhaust.

3) Heat Conduction:

The function of heat conduction is to allow heat to escape from the piston head to cylinder wall and then to cooling water and/or cooling fins. If the heat is not allowed to decrease, oil temperature will increase. These results in reduced oil viscosity and increased oil consumption.

4) Bearing:

Pistons have reciprocation motion in both expansion and compression strokes. Because of this the piston exerts a higher pressure against one side of the cylinder wall during the expansion stroke. The piston ring assures a proper clearance between the piston and the cylinder wall while maintaining complete contact around the entire circumference of the cylinder wall. This prevents both gas blow by and piston scoring.

2. The quality advantages of NPR Steel Rings.

NPR's unrivaled Piston Rings and Pistons will satisfy the needs of today's higher performance engine. All Piston Rings and Pistons listed in this catalog are the results of our hard bench engine tests taking into consideration material composition and surface treatment design. These tests on actual engines were conducted with the cooperation of the automobile manufacturer to assure a proper match to your engine's specifications.

Material – Steel vs. Cast Iron vs. Ductile Iron.

Today's modern engines have higher operating temperatures, higher compression, higher stress and higher restrictions on emissions. These conditions have put greater demands on piston rings. Steel rings outperform their cast iron predecessors in reduced oil consumption, reduced blow by, reduced wear, reduced breakage, and reduced friction.

Oil consumption

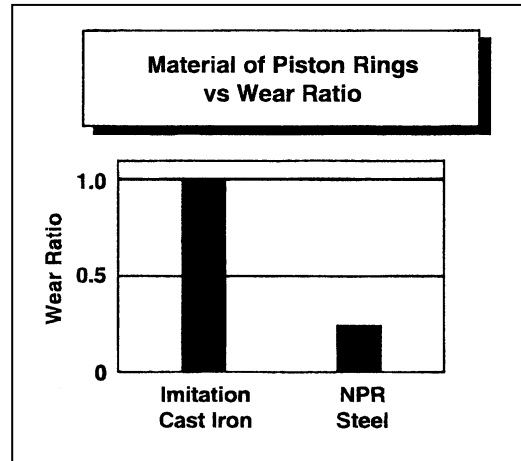
Steel piston rings allow for a reduction in the radial wall thickness. This (thinner) and lighter design seals more completely against the ring groove. Also, the steel ring with greater strength, reduced width conforms better to less than perfect cylinder bores. These two advantages reduce oil consumption by more than 30%.

Durability of Steel

The inherent strength of high alloy steel dramatically reduces the chance of ring breakage. Late model engines have reduced their ring thickness from 2.0 to 1.2 and 1.0 mm. Steel also provides for longer service life because ring wear is reduced by over 60%. Simply stated steel rings last 50% longer.

Steel Piston Rings

- Advantages:** Higher tensile strength.
Higher yield strength.
Greater fatigue life.
Greater hardness.
Lower ring mass.
- Benefits:** Better stress resistance.
Reduced rings side wear.
Reduced grooves pound out.
Longer service life.
Better conformability.
Superior oil economy.
Superior blow-by control.
Lower friction.



Surface Treatment

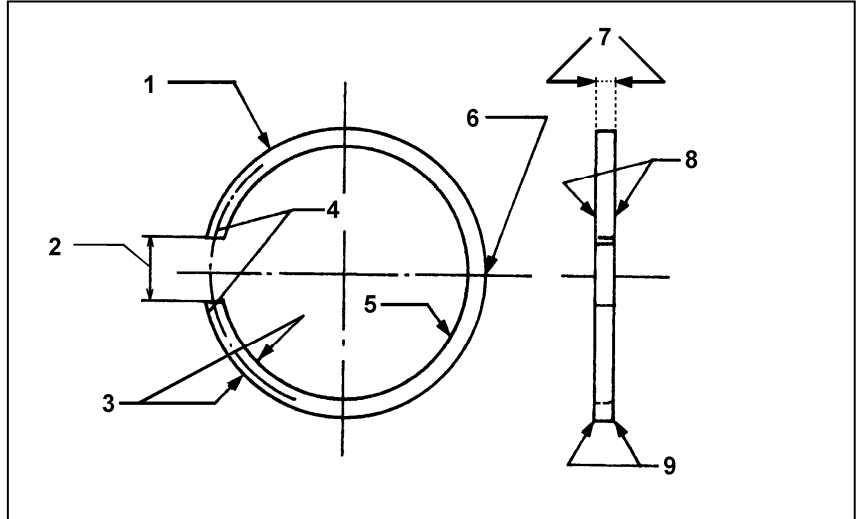
NPR's surface treatment is also very high quality, and the result of our technology. The chart below shows surface treatment comparison.

Surface Treatment	Anti Scuffing	Anti Wearing	Anti Damage to other parts.	Anti Corrosion	Cost
Chrome	Good	Good	Good	Good	Very Good
Moly	Good	Poor	Very Poor	Poor	Good
Gas Nitride	Good	Very Good	Very Good	Very Good	Good
PVD	Excellent	Excellent	Excellent	Excellent	High

3. Piston Ring – Name of Parts

Free (Unstressed) Ring

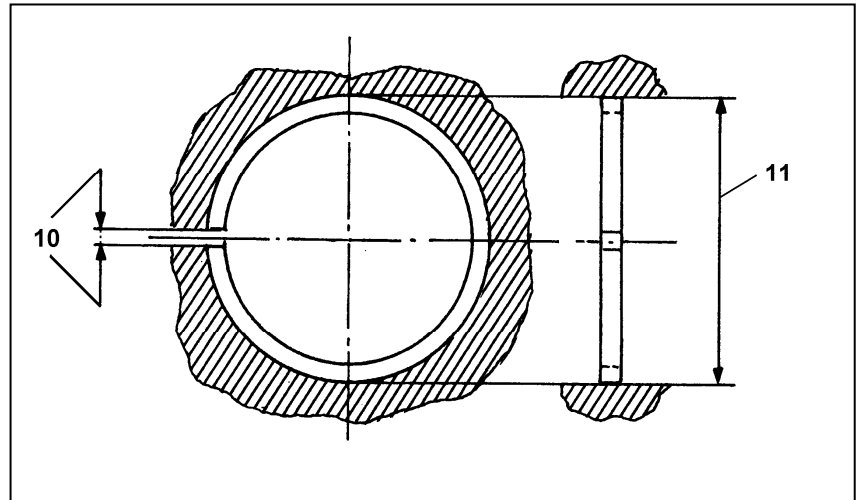
1. Ring face or Periphery.
2. Total free gap (m).
3. **T**: Radial wall thickness (ai).
4. Butt ends.
5. Inside Surface.
6. Back of the ring.
7. **B**: Ring width (h1)
8. Side Face.
9. Peripheral edges.



Closed Gap

10. Closed gap (S1).
11. Cylinder Bore (H).
Nominal ring diameter (d1).

Symbols in () are as given in :
ISO6621/1
SAE J1588
JIS B 8032



Recommended Closed Ring Gap

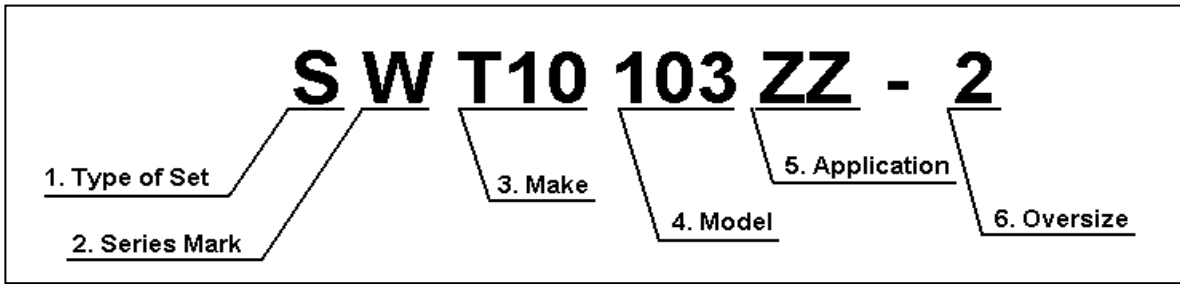
NPR generally manufactures its rings to meet the JIS (Japanese Industrial Standard) B8032-6-1998. It is important to recognize that some end gaps for individual engines may vary from this standard because of the original engine manufacturer's requirements. The table appearing below is for reference only. All sizes are in millimeters. See page #xi for more information.

Recomendacion De Cierre Del Espacio Final Del Anillo (End Gap)

NPR generalmente fabrica sus anillos para piston siempre siguiendo las normas del FIS (El estandar industrial Japonés) B8032-6-1998. Es importante reconocer que en algunos motores, el espacio final del anillo puede variar del JIS a causa de los requerimientos del fabricante. La tabla que aparece debajo es de referencia solamente. Todas las medidas son en milímetros.

Cylinder Bore Size	Compression Ring Gap	2pc. Oil Ring Gap	3pc. Oil Ring Gap
40.00 ~ 59.00	0.15 ~ 0.35	0.15 ~ 0.35	-
60.00 ~ 74.00	0.20 ~ 0.40	0.20 ~ 0.40	0.20 ~ 0.95
75.00 ~ 89.00	0.25 ~ 0.50	0.25 ~ 0.50	0.25 ~ 1.00
90.00 ~ 109.00	0.30 ~ 0.55	0.30 ~ 0.50	0.30 ~ 1.05
110.00 ~ 120.00	0.35 ~ 0.60	0.35 ~ 0.60	0.35 ~ 1.10

4. Explanation of NPR Ring set Code.



1) Type of Set.

S: Eleven digits code started with S represents a complete set of piston rings for an engine model S assigned by Make and Model codes. For instance, TOYOTA 22RE (4 cylinder) has been assigned as T10103. In this case, SWT10103ZZ-2 represents four sets of each 1st, 2nd, and oil rings.

Y: Eleven digits code started with Y represents only one cylinder set of piston ring. In case of TOYOTA 22RE, YWT10103ZZ-2 represents one set of 1st, 2nd, and oil rings.

Note: NPR has both engine set (S-) and cylinder set (Y-) code in the same Make, Model and Application for some makes (HONDA / ISUZU / SUZUKI / YAMAHA etc.).

Note 2: Since a cylinder set code (Y-) represents a piston ring set for only one cylinder, an engine requires a cylinder set multiplied by the number of cylinders of the engine.

2) Series Marks

Series Mark	Series #	Series Mark	Series #
A	100	L	100X
B	300	M	300X
C	500	N	500X
D	555	R	Mt.100X
F	Mt.100	S	Mt.300X
G	Mt.300	T	Mt.500X
H	Mt.500	W	777
J	Mt.555	X	Mt.777

US Application

Most of Piston Rings for Gas Engine : Mt.777 or 777.

Most of Piston Rings for Diesel Engine : Mt.555 or 555.

Export Piston Rings

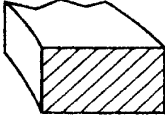
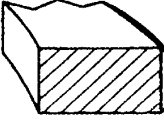
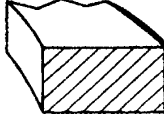
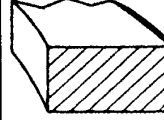
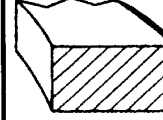
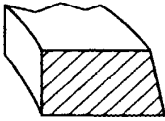
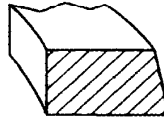
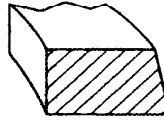
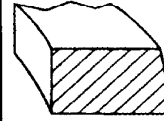
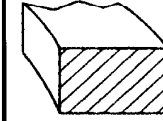
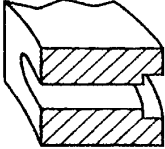
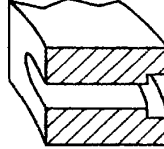
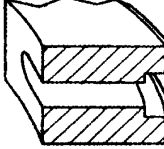
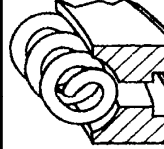
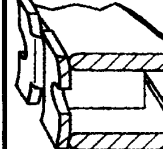
There are varieties of Piston Ring Series. Please see above.

Important Note!

From time to time the surface treatment specifications may be changed. Contact NPR, if you have questions on individual engine applications.

Explanation of Series #

There are various combinations of piston rings to make the set suitable to the engine. Using a ring set containing three rings per cylinder, we explain our basic Series #'s as under:

Series #	100	300	500	555	777
Top Ring					
2nd Ring					
Oil Ring					
Feature	Ring set without Chrome Plating.	1st Ring is Chrome Plated.	1st Ring and Oil Ring are Chrome Plated.	This ring set employs Dieselelex ring (incorporating a coil expander) as the oil control ring.	This ring set employs Nifflex ring (Consisting of combination of three pieces) as the oil control ring.

Mt. : Top and bottom sides of the ring are Chrome Plated.

X : Plate expander is coupled with oil control ring.

Important Note!

Diesel Ring 555 Series:

Because Diesel Cylinders may have different inside Cylinder wall surfaces, NPR ring surface treatments on Top and Oil Control Ring will change:

Ring Type

Surface Treatment

555

Chrome on outside contact surface.

Mt.555

Chrome on Top, Bottom and Outside contact surface. There may be Chrome on the inside surface depending on individual application.

Mt.555F

Chrome on Top and Bottom surfaces, but no Chrome on outside contact surfaces. Typically used in Chromard Liner applications.

From time to time the surface treatment specifications may be changed. Contact NPR, if you have questions on individual engine applications.

3) **Make (Bold – New Part # Style)**

<u>Code</u>	<u>Make</u>
A10	ASIA
C10	CHRYSLER
D10	DAIHATSU
D20	DAWEOO
E10	EUROPAN APPLICATION
F30	FORD
F20	SUBARU
G10	GMC
G30	HYUNDAI
H20	HINO
H30	ACURA, HONDA
I10	ISUZU, (GM, CHEVROLET, GEO)
K04	KOMATSU
K30	KIA
M30	mitsubishi, (CHRYSLER, DODGE, EAGLE, PLYMOUTH, HYUNDAI)
M31	MITSUBISHI, (HYUNDAI)
N30	INFINITI, NISSAN, (FORD MERCURY)
N31	UD TRUCK NISSAN (NISSAN DIESEL)
S20	SUZUKI, (GM, CHEVROLET, GEO)
T10	LEXUS, TOYOTA, (GM, CHEVROLET, GEO)
T20	MAZDA (FORD, MERCURY)

NOTE:

EXPLANATION OF MAKES IN PARENTHESIS ()

When engines are out-sourced, you may find some set codes which have a make code assigned for an engine manufacturer other than the vehicle manufacturer (For example: SWM31047 is used for Chrysler engine).

4) **Model**

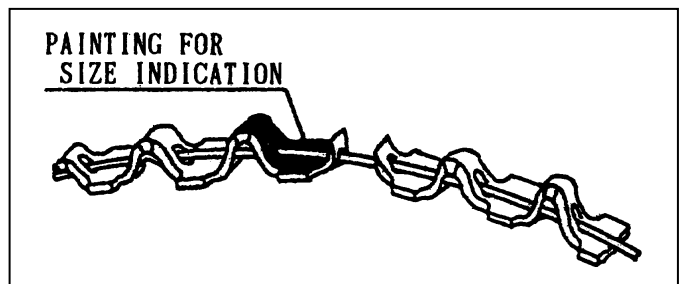
A three digit number is uniquely assigned by an engine model connected with a make code.

5) **Serial Code for Application**

Assigned by engineer.

6) **Oversize Code**

0:	Standard.	No Color
1:	Oversize (0.25mm).	White
2:	Oversize (0.50mm).	Blue
3:	Oversize (0.75mm).	Black
4:	Oversize (1.00mm).	Yellow
5:	Oversize (1.25mm).	Orange
6:	Oversize (1.50mm).	Green



* Indication is only for **Nifflex** type expander rings. *

* Please note that there may be some exceptions for this color code depending on the original manufacturers requirement. *

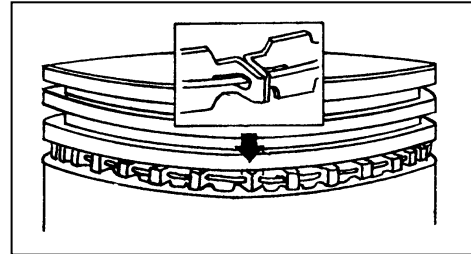
Installation Instruction of Oil Rings. (Instalacion del Anillo de Control de Aceite)



1. Series 777 Oil Rings. (Anillo de Aceite Serie 777)

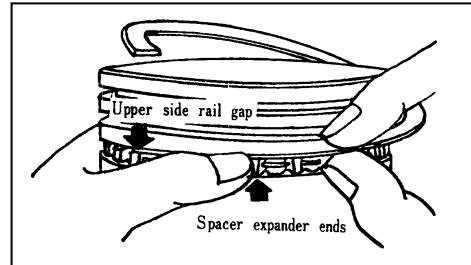
Fit the spacer expander into the ring groove, and ensure that the ends are butting as shown in the illustration.

Acomodar el espaciador dentro de la ranura y asegurarse que las orillas se lleguen a juntar, sin encimarse. Como se muestra en la ilustracion donde las orillas del espaciador se juntan.



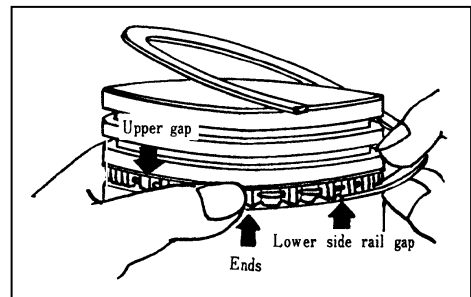
Hold with thumb the spacer expander with its ends completely butting. Install the upper side rail with its gap approximately 45 Degree left of Spacer Expander end.

Con el dedo pulgar sostener el espaciador donde se juntan ambas orillas. Instalar primero la lamina o riel superior con una distancia de una pulgada o 45 grados a la izquierda donde se juntaron las orillas del espaciador.



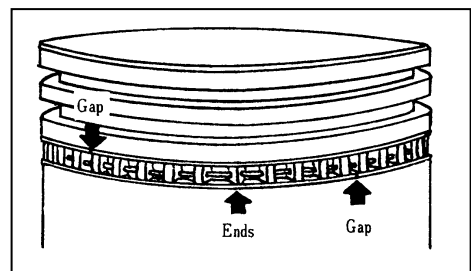
Install the lower side rail with its gap approximately 45 Degree right of the expander ends.

Posteriormente de la misma manera a como se menciono anteriormente se instala la lamina o riel inferior con una distancia de una pulgada o 45 grados hacia la derecha de donde se juntaron las orillas del espaciador.



If you have followed these instructions, this ring will Be installed as illustrated on the right. Make sure each gap is located as illustration to the right demonstrates.

Si usted ha seguido estas instrucciones como la ilustracion que aparece de lado derecho. Tiene que asegurarse que los huecos (Gap) sean colocados como se muestra en el dibujo.



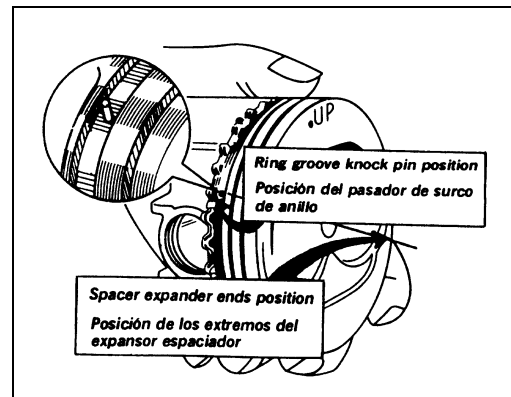
Installation Instruction of Oil Rings. (Instalacion del Anillo de Control de Aceite.)



2. Series 777 Oil Rings for Subaru EA Engine. (Serie 777 Anillo de Control de Aceite para Subaru Tipo de Maquina EA.)

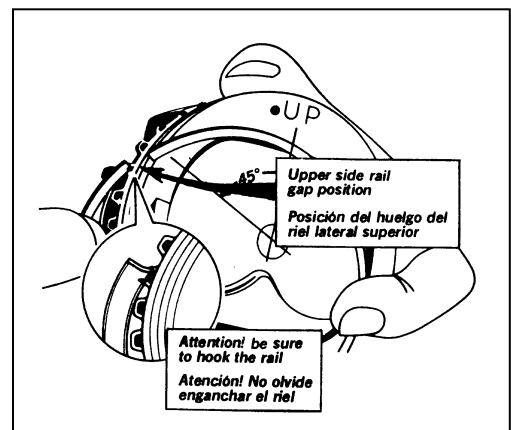
In EA Engine pistons, there is a knock pin in the oil ring groove. Install the spacer expander around the whole piston perimeter, placing its ends approximately 180 Degree from the knock pin.

Los pistones del motor EA tienen un pasador en el Surco del anillo aceitador. Instale el expansor Espaciador alrededor del perimetro total del piston, Ubicando sus extremos a unos 180 Grado de dicho pasador.



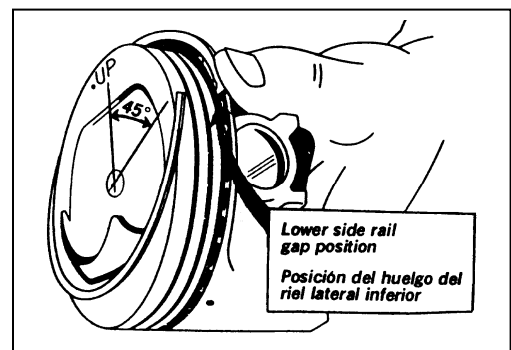
One of the two side rails has one of its ends slightly bent. Hook the bent part into the spacer expander, at a point located approximately 45 Degree left of the piston head “UP” mark, then install the rail around the whole piston perimeter (see figure).

Uno de los dos rieles laterales tiene uno de sus extremos ligeramente doblado. Enganche esta parte doblada en el expansor espaciador, en un punto ubicado a unos 45 Grado a la izquierda de la marca “UP” grabada en la cabeza del piston, e instale el riel alrededor del perimetro total del piston (ver figura).



Install the lower side rail with its gap approximately 45 Degree right of the piston head “UP” mark.

Instale el riel lateral inferior con su hueco ubicado a unos 45 Grado a la derecha de la marca “UP” grabada en la cabeza del piston.



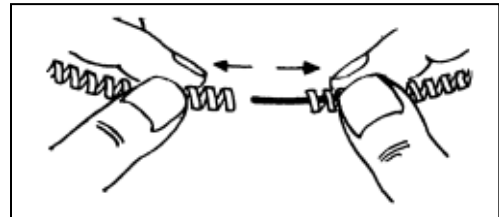
Installation Instruction of Oil Rings. (Instrucciones para Instalar el Anillo De Control de Aceite.)



3. Series 555 Oil Rings. (Anillo de Aceite Serie 555)

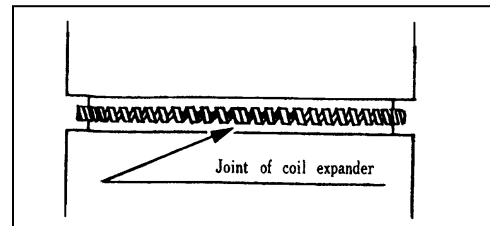
First, disconnect the joint of coil expander.

Primero, desconectar el alambriillo en forma de espiral del espaciador.



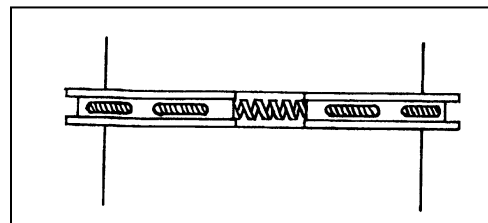
Next, encircle the 1st oil ring groove with coil expander and joint the ends of coil expander again.

Despues, instale el alambriillo en forma de espiral dentro de la ranura del piston en la ranura correspondiente y cerrar el circulo.



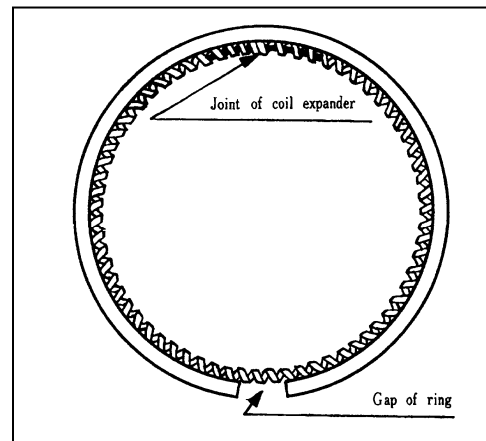
Last, install the ring outside of coil expander.
(Please use Piston Ring Installation Tool).

Finalmente, instalar el espaciador por fuera del alambriillo en forma de espiral.



The end of the ring must be placed on the opposite side of the joint of the coil expander.

Las orillas del anillo deben de ser colocadas del lado opuesto a la union del alambriillo en forma de espiral.

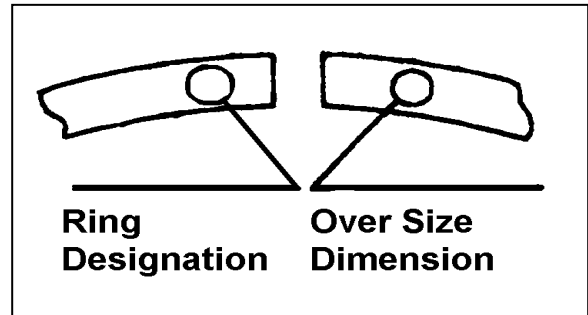


Installation Instruction of Compression Rings.



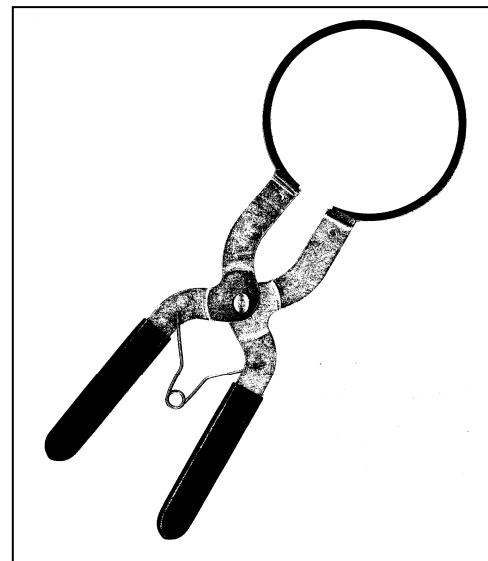
“N” or Number is facing upward when installed on the piston.

Siempre hay que asegurarse que al instalar el anillo de compresion para la primera ranura del piston, este debera notarse que la **N** y el numero **1** deberan estar siempre hacia arriba dentro la primera ranura del piston.



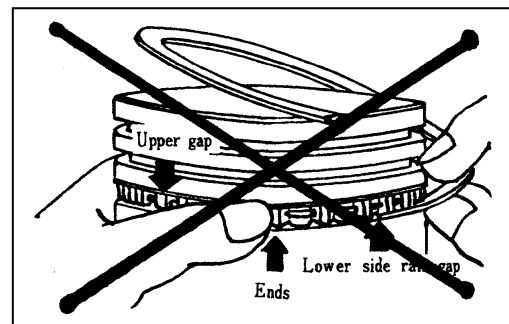
Use Piston Ring tool to expand the end gap. Then install 2nd and Top ring to Piston Ring Groove.

Siempre es recomendable usar herramienta especial, como Ensanchadores del Anillo de Piston. Para el segundo anillo de compresion se usa el mismo procedimiento del primer anillo de compresion, pero en este hay que notar que el numero **2** y la letra **N**, deberan estar siempre hacia arriba dentro de la segunda ranura del piston.



Do not install compression rings like rail rings.

Nunca hay que instalar los anillos de compresion de la misma manera que se instalan los anillos de control de aceite (rieles o laminas).



Piston Ring End Gaps / ABERTURA DE LUZ PARA ANILLOS

In the last 10 – 15 years engine and piston ring manufacturers have changed the dimensions of the TOP and second ring gaps. The general trend has been to reduce the top ring and enlarge the second ring gap.

The primary reason for this change was to reduce oil consumption in engines with low tension rings.

En los últimos 10 – 15 años los fabricantes de anillos para pistón han cambiado las dimensiones de abertura de luz para el primer y Segundo anillo. La tendencia general ha sido reducir la abertura de luz en la primera ranura y ampliar la Segunda ranura.

La principal razón de este cambio es reducir el consumo de aceite en máquinas con anillos de baja tensión.

This change in end gaps reduces oil consumption in two ways:

Este cambio en la abertura de luz reduce el consumo de aceite de dos maneras:

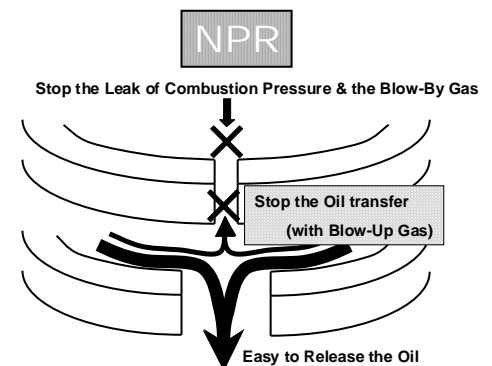
1. The reduced top ring gap helps reduce the flow of oil vapor from below the top ring to the combustion chamber (see “X” in diagram right)

El diseño de la abertura de luz en la primera ranura ayuda a reducir el flujo de vapor de aceite por debajo del anillo de la primera ranura a la cámara de combustión (vease “X” en el diagrama derecho).

2. The enlarged second ring gap increases gas flow from the piston land between the Top and Second ring to below the Second Ring, and avoids accumulation of the pressure between the Top and Second Ring. By doing so, this reduces the period of the pressure between the Top and Second ring higher than combustion chamber and reduces the flow of oil vapor from below the Top ring to the combustion chamber. A second advantage to this is that it will allow the top ring to seat better against the bottom of the piston ring groove, which will also reduce oil consumption.

La abertura de luz del segundo anillo al ser más amplia permite incrementar el pase de flujo de gases entre el primer anillo y el segundo anillo y evita acumulación de presión entre estos. Al suceder esto reduce el tiempo de presión que se acumula entre el primer anillo y el segundo evitando que haya escape de aceite a la cámara de combustión, a través del primer anillo. Una Segunda ventaja a esto es que permitira que el primer anillo asiente mejor contra el fondo del surco del pistón, que redujera también el consumo de aceite.

- CONTINUE



To use one standard for all end gaps is no longer correct. The correct end gap for each engine depends on many factors including tension, ring material, ring shape, piston shape and combustion pressure. As examples listed below are the correct end gaps for today's more popular engines:

Para utilizar un estandar para todas las aberturas de luz, no es correcto, La medida correcta por cada motor depende de Muchos factores incluyendo la tension, el material del anillo, la forma del anillo, la forma del piston y la presion del combustible. A continuacion mostraremos unos ejemplos de abertura de luz actualizados para las motores mas populares de hoy:

<i>Engine</i>	<i>Ring#</i>	<i>Top Ring Gap</i>	<i>2nd Ring Gap</i>
Isuzu 4ZDI	SWI10123	0.35-0.55mm	0.35-0.55mm
Isuzu 4ZEI	SWI10162	0.20-0.40mm	0.30-0.50mm
Mitsubishi G15B	SWM31063	0.20-0.40mm	0.20-0.40mm
Nissan E16	SWN30057	0.20-0.30mm	0.15-0.25mm
Nissan Z24	SWN30085	0.30-0.50mm	0.55-0.70mm
Suzuki G13A	SWS20141	0.15-0.35mm	0.20-0.40mm
Suzuki G13BA	SWS20143	0.20-0.40mm	0.20-0.40mm
Toyota 22R	SXT10077	0.22-0.40mm	0.18-0.33mm
Toyota 22R	SWT10103	0.25-0.45mm	0.60-0.75mm
Toyota 3E	SWT10143	0.25-0.45mm	0.15-0.30mm
Toyota 4AF	SWT10142	0.20-0.35mm	0.35-0.55mm
Toyota 4AL	SWT10108	0.20-0.35mm	0.15-0.30mm

NPR manufacturers each piston ring gap with the correct OEM specification for each individual engine. There is no need, nor do we recommend that you alter them in anyway as this might void our warranty. Also note these end gaps are set at exact bore dimensions. If the bore is slightly oversize (for example 92.52mm instead of 92.50mm) then the end gap will increase accordingly.

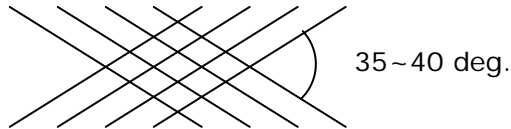
NPR fabrica sus anillos con la especificacion correcta de OEM(Equipo Original) para cada motor individual y es ello que la abertura de luz es diferente de un motor a otro aunque tengan el mismo diametro. Por lo tanto no hay necesidad, ni recomendamos que usted los altere, haciendo esto puede anular la garantia del producto. Tambien notese que la abertura de luz en nuestros anillos estan diseñados exactamente a la medida del diametro interno del cilindro.. Por ejemplo si el diametro es levemente fuera de sobre medida(Ejemplo: 92.52mm en lugar de 92.50mm) la abertura de luz se incrementara por consiguiente.

Finalmente siempre instale anillos NPR, los mejores del mundo.

Cylinder Honing Recommendation

For use with our piston rings we recommend a Plateau Honing with a Cylinder Bore cross hatch angle of 35 – 40 degrees.

Para el uso de nuestros anillos nosotros recomendamos una meseta que afila con piedra Con un angulo de trampa de cruz de 35- 40 grados (Cross Hatch)



For NPR Piston Rings we recommend a roughness of:

NPR recomienda para sus anillos , una aspereza de :

$R_z = 59 - 138 \mu \text{ in } [= 1.5 - 3.5 \mu \text{m}]$ or

$R_a = 15 - 35 \mu \text{ in } [= 0.4 - 0.9 \mu \text{m}]$

To reach this roughness the manufacturers of honing machines & accessories recommend to use for a gray cast iron engine block

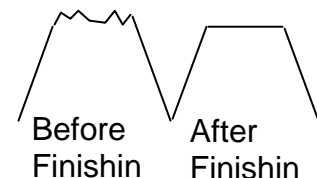
- Conventional stones #220 - #280 grit or
- Diamond stones #325 - #550 grit

Para alcanzar esta aspereza los fabricantes de maquinas de afilado y accesorios relacionados a la rectificacion de motores recomiendan usar para bloques de motor de hierro fundido grisaceo lo siguiente:

- Piedra convencional # 220 - # 280 o
- Piedra con diamante # 325 - # 550

After honing with either conventional or diamond stone, the same manufacturers suggest to finish your honing by smoothing the surface with a fine grit conventional abrasive (#400 - #600 grit) or to sweep the bores with a flexible brush or a nylon bristle plateau honing tool. This is necessary to get rid of jagged peaks and folded & torn material.

Despues del afilado convencional o si se uso la piedra con diamante, los mismos fabricantes sugieren para darle terminado final deben de hacer un afilado para suavizar la superficie con un abrasivo convencional (400- # 600) O cepillandolo con uno de nylon flexible. Esto es necesario para eliminar los picos dentados y de material doblado o rasgado.



- CONTINUE

Important Note –

Be sure to reconfirm with your honing equipment manufacturer that the recommended stone grit will produce our R_Z and R_a roughness recommendations.

Nota Importante.

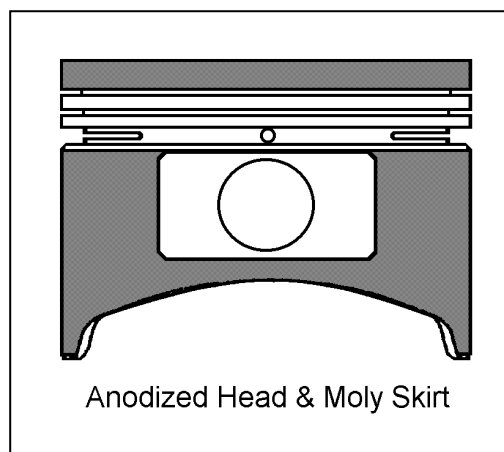
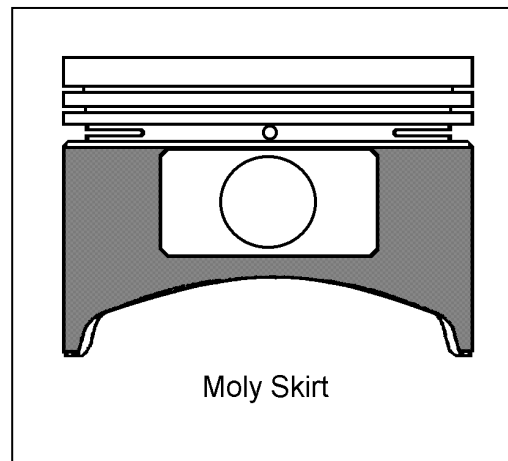
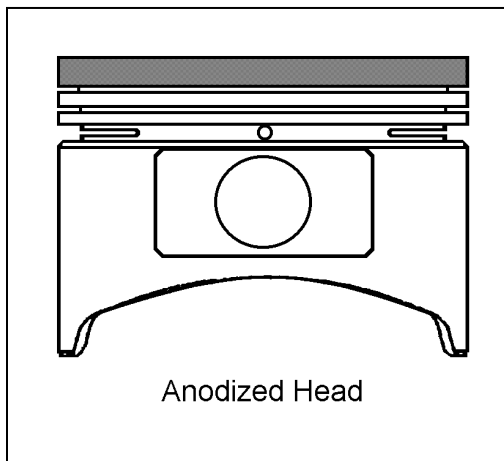
Estar seguro de reconfirmar con el fabricante del equipo de afilado que los granos de arena recomendados de piedra produzcan nuestro RZ y las recomendaciones de aspereza de RA

PISTON SURFACE TREATMENT

TRATAMIENTO SUPERFICIAL DEL PISTON

Pistons from many late model engines have added piston skirt coatings to reduce friction and cylinder wall clearance. Anodized piston heads to deflect heat are also becoming more common. Whenever original equipment pistons have these surface treatments for a specific application, NPR pistons will also have moly skirts and/or anodized heads. It is important to note that pistons with moly skirts require tighter cylinder wall clearances. Please refer to the piston “Piston Buyers Guide” beginning on page 267 for specific cylinder wall recommendations for each piston part number.

Pistones de modelos recientes han agregado capas a la falda del piston para reducir la friccion y la holgura de la pared del cilindro. Pistones con cabeza anodizado para disipar el calor tambien estan siendo mas comunes. Cuando el piston de equipo original tenga este tipo de tratamientos para una aplicacion en especifico, los pistones de NPR tambien tendran faldas de molibdeno y/o cabezas anodizadas. Es importante resaltar que pistones con faldas de molibdeno requieren una holgura mas apretada en la pared del cilindro. Por favor de referirse a la seccion “Piston Buyers Guide” iniciando en la pagina 267 Para recomendaciones especificas de la pared del cilindro para cada numero de piston en especifico.



Abbreviation & Words on this catalog.

1 Cyl Pkg	1 Cylinder Package.
1 Cyl Set	1 Cylinder is 1 Engine Set.
1 st Cr Plt	1 st ring is Chrome Plated.
1 st -Plt	1 st ring is Plated.
1 st -Steel	1 st ring is Steel.
1 st -GN	1 st ring is Gas Nitrided.
1 st -HKS	1 st ring is Half Keystone.
1 st -IB	1 st ring is Inner bevel.
1 st -KS	1 st ring is Keystone.
1 st -KSGN	1 st ring is Keystone & Gas Nitrided.
1 st -SPRYD	1 st ring is Sprayed
2 nd ESTUC	2 nd ring is Effective Seal Taper Under Cut.
2 nd ESUC	2 nd ring is Effective Seal Under Cut.
2 nd -IC	2 nd ring is Inner Cut.
2 nd -HKS	2 nd ring is Half Keystone.
2 nd -Plt	2 nd ring is Plated.
4WD	Four Wheel Drive.
All Plt	All Surface are Plated.
C & F	Engine is Carburetor or Fuel Injection.
CALIF. E.C.S.	California Emission Control System.
CARB.	Carburetor Engine.
CYL #1, 3	For Cylinders 1 and 3 only.
CYL #1,3,5	For Cylinders 1, 3 and 5 only.
CYL #2, 4	For Cylinders 2 and 4 only.
CYL #2,4,6	For Cylinders 2, 4, and 6 only.
D.O.H.C	Dual Over Head Cam.
Diesel	Diesel Engine.
F.I.	Fuel Injection Engine.
F.W.D	Front Wheel Drive.
FRONT	Front side of engine bank only.
FUEL Pkg	Fuel Package.
Left	Left-hand side of engine bank only.
O1	Oil Control Ring #1
O2	Oil Control Ring #2
O.H.V.	Over Head Valve.
R.W.D.	Rear Wheel Drive.
Right	Right hand side of engine bank only.
S.O.H.C.	Single Over Head Cam
TBA	To Be Announced
W/	With.
W/o	Without.
(Forklift)	This Piston Ring is used for Forklift engine, too.

Limited Warranty

1. NPR of AMERICA, Inc. warrants to the original owner that all engine products sold are free from any defects in material or workmanship for a period of 5 years or 60,000 miles from the date of purchase, whichever occurs first, subject to the following conditions:
 - a) NPR of America, Inc. warranty is only valid when NPR engine products are sold and installed as sets.
 - b) NPR of AMERICA, LLC disclaims all warranties, express or implied unless the customer receives authorization from NPR of AMERICA, LLC
 - c) Subject to the provisions of subparagraph (d), NPR of AMERICA, LLC. shall, at its option, repair or replace any parts within the warranty term. Authorized repairs will be paid at the Mitchell Labor Estimating Guide rate of \$20.00 (Twenty Dollars) per hour or 3 (Three) times the purchase cost of the failed part, whichever is the least.
 - d) This warranty shall not apply to or include any of the following:
 - I) Repair or replacement following any accident, misuse, collision, upset or comprehensive insurance claim.
 - II) Any parts that have been subjected to speed trials, racing, competition time trials, and commercial application or off road use.
 - III) Any parts that have been modified or altered or to which a device or accessory not recommended by the **original manufacturer has been installed.**
 - e) To the extent permitted by the law, the parties agree that this warranty shall be IN LIEU OF WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. No dealer, or any agent or employee thereof, is authorized to extend or enlarge this warranty. ANY STATEMENTS BY SUCH DEALERS, AGENTS OR EMPLOYEES DO NOT CONSTITUTE WARRANTIES, shall not be relied on by the buyer and are not part of the contract for sale. If notwithstanding this paragraph, a warranty is implied by law, such warranties shall be limited to the duration of this written warranty as set out in paragraph 1 above. Some states do not allow limitations on implied warranties, so the above limitation may not apply to you. Warranty shall cover the cost of the failed part, and not the replacement cost of the said part.
2. LIMITED LIABILITY: As stated previously, the liability of NPR of AMERICA, Inc. under this WARRANTY IS LIMITED SOLELY TO THE REPAIR OR REPLACEMENT OF DEFECTIVE PARTS OR WORKMANSHIP subject to the conditions described elsewhere within this warranty. NPR of AMERICA, Inc. SHALL NOT BE LIABLE FOR ANY INCIDENTAL, SPECIAL, CONSEQUENTIAL, or EXEMPLARY DAMAGES, or for any service not expressly provided for, relating to the use from NPR of AMERICA, Inc. products. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation may not apply to you. This warranty gives you special legal rights that vary from state to state.

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