

**Special tools required:**

- 00 2 590
- 00 9 120

**Important!**

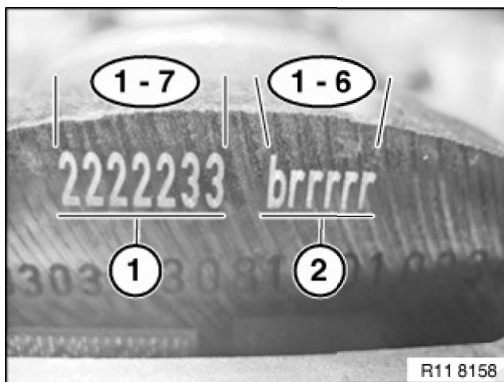
Modified procedure:

All crank pins are connected with the crankshaft.

The Blue/Red connecting rod bearing shell colours are **no longer** fitted in combination.

**Necessary preliminary tasks:**

- Removing oil sump.

**Important!**

All crankshaft crank pins are classified.

The identification (2) is located on the first crank web.

Optional classifications (2) per connecting rod

On the connecting rod and connecting rod bearing cap:

- r. Connecting rod = Yellow.
Connecting rod bearing cap = Red.
- b. Connecting rod = Violet.
Connecting rod bearing cap = Blue

**Example:**

Possible classification: b r r r r r

Cylinder 1: Classification b

Violet (connecting rod) / Blue (connecting rod bearing cap)

Cylinder 2: Classification r

Yellow (connecting rod) / Red (connecting rod bearing cap)

Cylinder 3: Classification r

Yellow (connecting rod) / Red (connecting rod bearing cap)

Cylinder 4: Classification r

Yellow (connecting rod) / Red (connecting rod bearing cap)

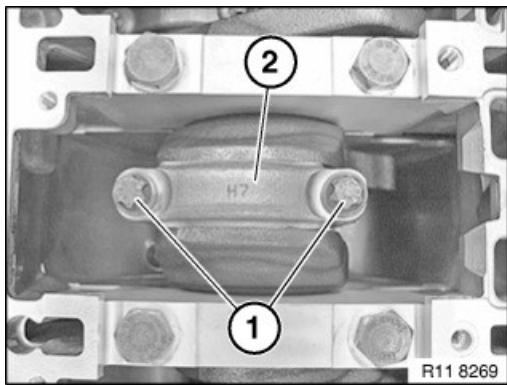
Cylinder 5: Classification r

Yellow (connecting rod) / Red (connecting rod bearing cap)

Cylinder 6: Classification r

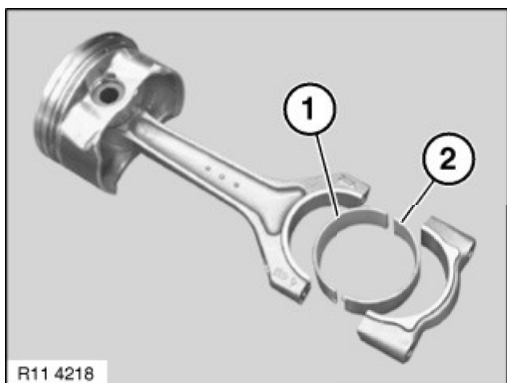
Yellow (connecting rod) / Red (connecting rod bearing cap)





Release connecting rod bolts (1).

Remove connecting rod bearing cap (2).



Important!

Risk of damage to cylinder wall and to crankshaft.

Gently release connecting rod from crankshaft.

Remove connecting rod bearing shells (1 and 2).

Use new connecting rod bearing shells according to code letter.

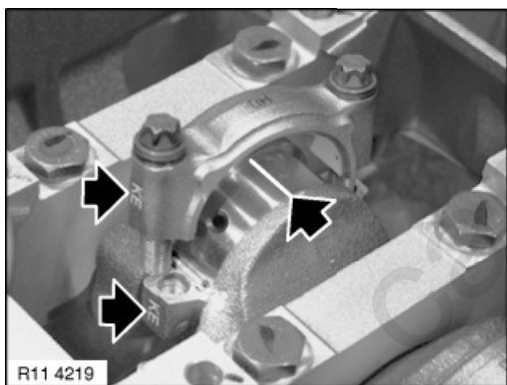
Installation note:

Pay attention to guide lugs during installation.

Important!

All crankshaft crank pins are classified.

In each case insert only one colour of connecting rod bearing shell (1 and 2) for each connecting rod.



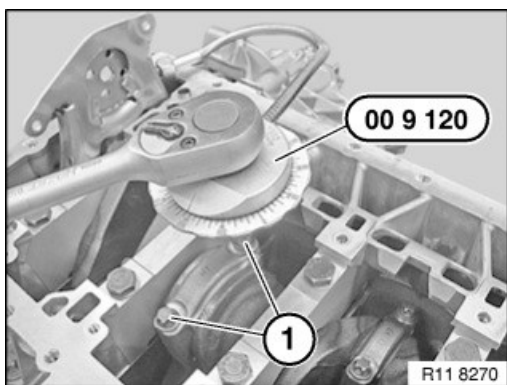
Check connecting-rod bearing play.

Piston in BDC position.

To determine the connecting rod bearing play, make sure that the bearing positions are clean and free from oil and grease.

Fit special tool 00 2 590 (Plastigage type PG 1) to oil-free crankshaft.

Fit connecting rod bearing cap so that pairing letters match up.



Important!

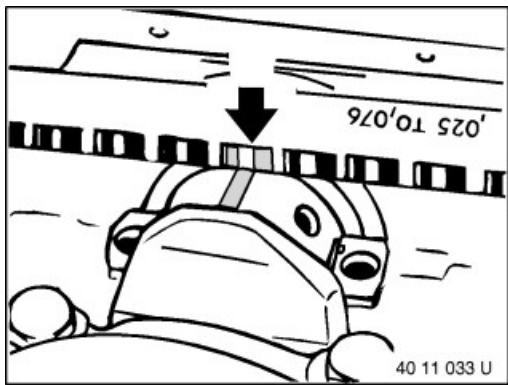
Do not distort connecting rods or crankshaft.

Use the old connecting rod bolts to check connecting-rod bearing play.

Tighten down connecting rod bolts with special tool 00 9 120 .

Tightening torque 11 24 1AZ.





Unscrew connecting rod bearing cap. Read off connecting rod bearing play at width of flattened Plastigage on measurement scale.

Connecting rod bearing play.

- Remove Plastigage
- Coat crankshaft and connecting rod bearing shells with oil
- Install new connecting rod bolts and tighten down with special tool 00 9 120 .

Tightening torque 11 24 1AZ.



Assemble engine.

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**Special tools required:**

- 00 9 120
- 11 4 491
- 11 4 492
- 11 8 141
- 11 8 562
- 11 8 564
- 11 8 590

**Warning!**

Safety goggles must be worn when working on the gudgeon pin circlip.

**Important!**

If pistons, connecting rods and connecting rod bearing shells are reused, they must be reinstalled in the same places.

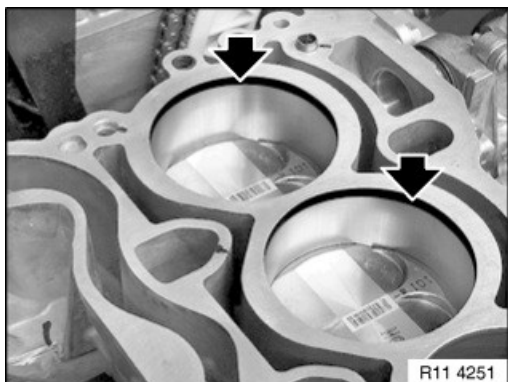
Piston and gudgeon pins are paired and must not be fitted individually.

Individual connecting rod replacement is not permitted; they are classified by weight class.

Connecting rods and connecting rod bearing caps are marked with the same pairing letters; mixing them up will result in engine damage.

**Necessary preliminary work:**

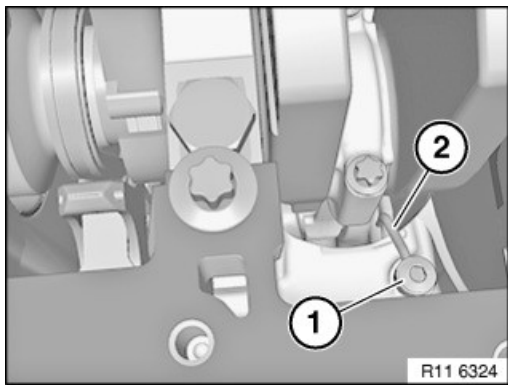
- Remove engine.
- Mount engine on assembly stand.
- Remove intake plenum.
- Remove cylinder head.
- Remove oil sump.
- Remove oil pump.

**Note:**

In event of heavy oil carbon residue:

Carefully remove oil carbon residue from cylinder wall. **Note:** Graphic shows N46.



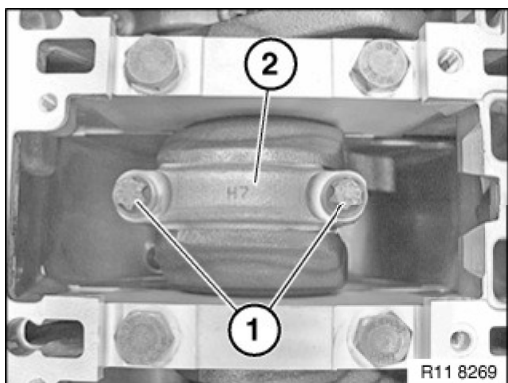


Important!

Do **not** release screw (1).

Oil spray nozzle (2) must not be maladjusted or bent.

If necessary, readjust (**risk of damage**).



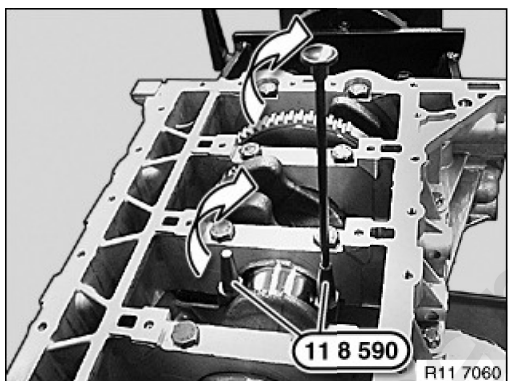
Release connecting rod bolts (1).

Tightening torque 11 24 1AZ.

Remove connecting rod bearing cap (2).

Important!

Connecting rods and connecting rod bearing caps are marked with the same pairing letters; mixing them up will result in engine damage.

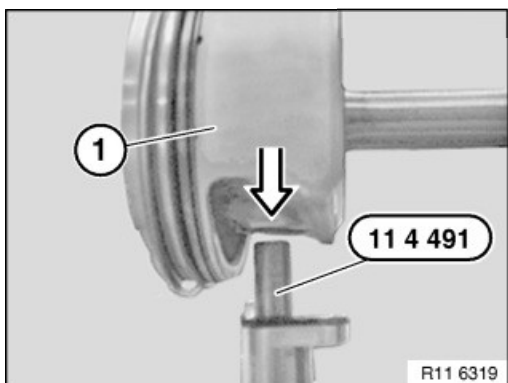


Screw special tool 11 8 590 into big end of connecting rod.

Press out connecting rod and piston to cylinder head side.

Important!

Risk of damage to oil spray nozzle.



Preliminary work:

Secure special tool 11 4 491 in vice.

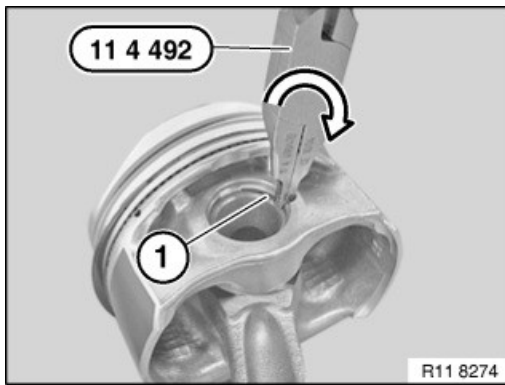
Secure piston (1) with connecting rod to special tool 11 4 491 .*Note:* Graphic shows N52.



Warning!

Safety goggles must be worn for the next operation.



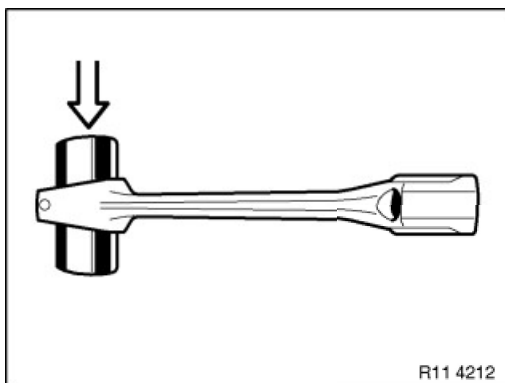


Warning!

Safety goggles must be worn.

To lever out piston circlip (1), support with special tool 11 4 492 on piston (2).

Lever out piston circlip (1) with special tool 11 4 492 in direction of arrow.



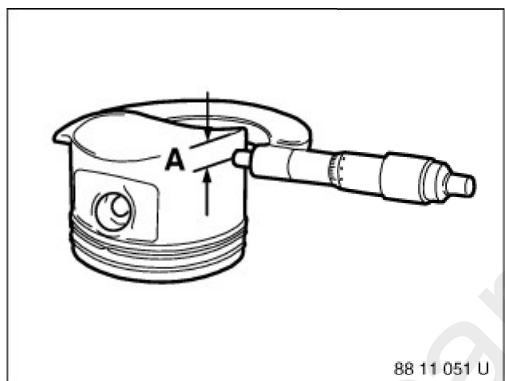
Important!

Connecting rods are divided into weight classes and are only available as a set.

Old and new connecting rods must not be installed in mixed combinations.

Installation note:

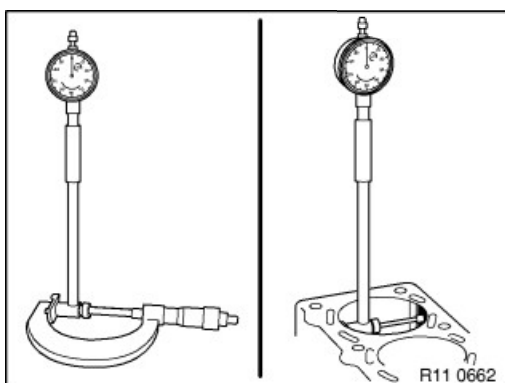
The gudgeon pin must be able to be pressed through the bush by hand with little force and must not display any significant play.



Measuring piston installation clearance:

Measure piston diameter with micrometre at measuring point A from lower edge of piston and offset at 90° to the axis of the gudgeon pin.

Piston diameter at measuring point A.



Adjust micrometre to cylinder bore of engine block. Set internal measuring device on micrometre to zero. Measure bottom, centre and top of cylinder bore in direction of travel and direction of rotation.

Diameter of cylinder bore.

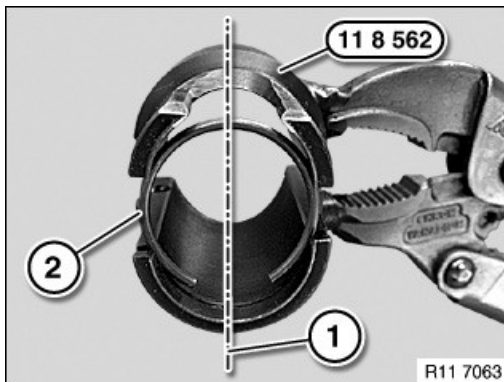
Piston installation clearance.

Permissible total wear clearance.

Installation note:

If necessary, replace piston.





Warning!

Safety goggles must be worn.

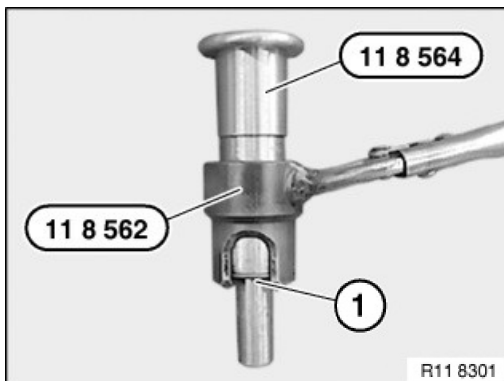
Important!

The opening of the piston pin circlip must be installed on the piston in the **6 o'clock position**.

Risk of damage!

Insert piston circlip (2) into groove of special tool 11 8 562 .

Bring piston circlip (2) into working position (1).

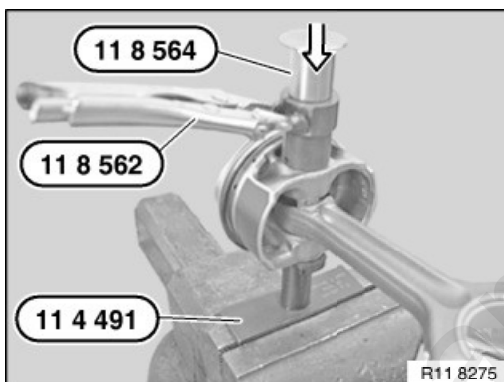


Warning!

Safety goggles must be worn.

Slide on special tool 11 8 564 up to piston pin circlip (1)

Special tools 11 8 562 and 11 8 564 are prepared.



Warning!

Safety goggles must be worn.

The aperture on special tool 11 8 562 must point to piston crown; only then can special tool 11 8 564 be fitted correctly.

If the special tools 11 8 562 and 11 8 564 are not positioned correctly, the piston pin circlip must be driven in using a plastic hammer in direction of arrow.

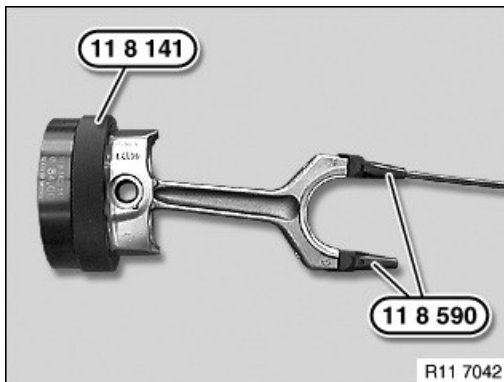
Note:

See graphic.



Piston pin circlip is correctly installed when opening (1) points downwards.





Install all piston rings.

Install all bearing shells.

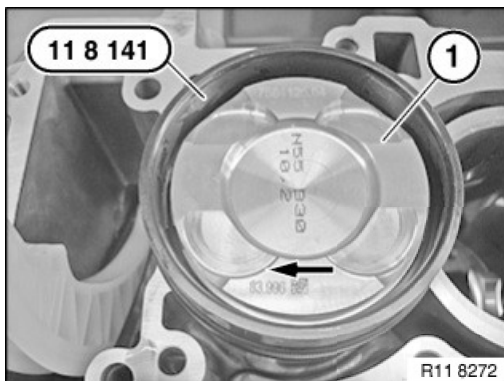
Coat piston and piston rings with oil.

Pre-install piston (2) in special tool 11 8 141 .

Screw on special tool 11 8 590 in connecting rod (2).

Installation note:

Make sure protective lugs (1) on special tool 11 8 590 are positioned correctly and check for damage.



Insert piston with connecting rod in cylinder.

Important!

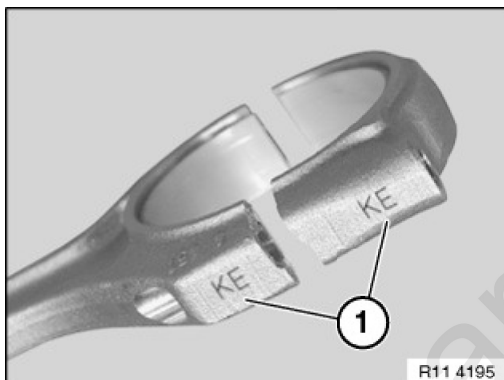
Risk of damage to oil spray nozzle.

Risk of breakage of piston rings.

Press in piston in direction of arrow with finger pressure only, do not drive in.

Insert piston so that arrow on piston crown points to camshaft drive.

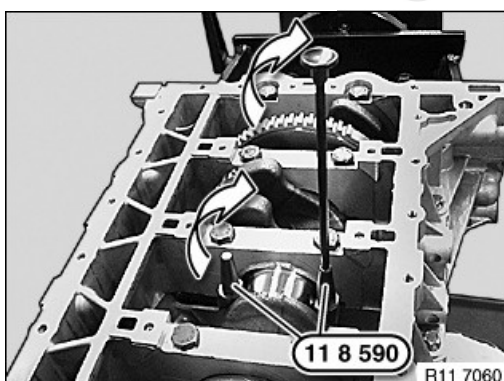
Press in piston (1) with special tool 11 8 141 .



Important!

Connecting rod and connecting rod bearing cap are marked with pairing letters (1) and must not be mixed up.

Swapping or incorrectly fitting the connecting rod bearing cap on the big end will result in **engine damage**.



Apply a light coat of oil to crankshaft journal.

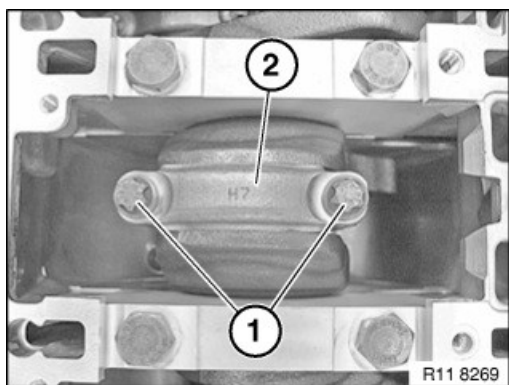
Assemble connecting rod and crankshaft journal.

Screw off special tool 11 8 590 in anti-clockwise direction.

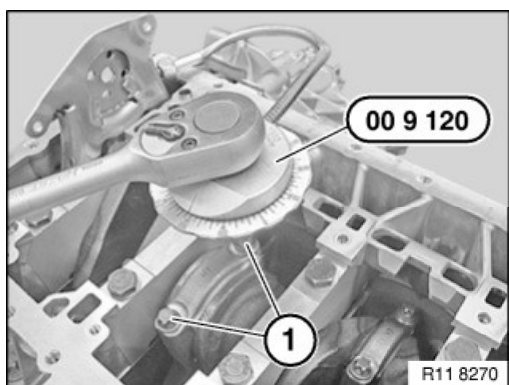
Note:

Illustration shows N54.





Fit bearing caps (2) so that pairing letters match up.
 Install new connecting rod bolts (1).
 Join connecting rod bolts (1).
 Tightening torque 11 24 1AZ.



Secure connecting rod bolts (1) with special tool 00 9 120 .
 Tightening torque 11 24 1AZ.

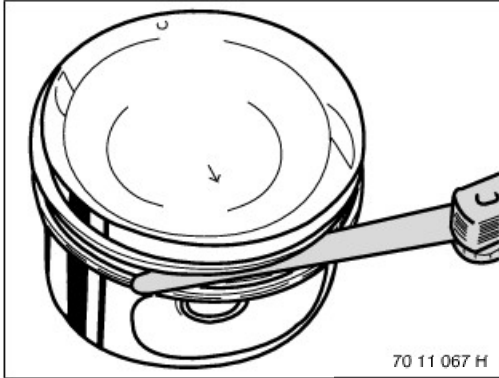


Assemble engine.



*Necessary preliminary tasks:*

- Remove all pistons.

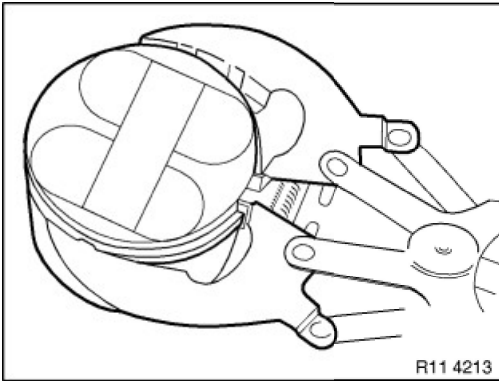


Measuring side clearance of piston rings in piston ring groove.

Technical Data.

Note:

It is not possible to measure the axial clearance of the M-flex rings.



Remove plain rectangular compression ring and stepped ring upwards with piston ring pliers.

The M-flex ring comprises two steel band rings and a bearing spring.

Note:

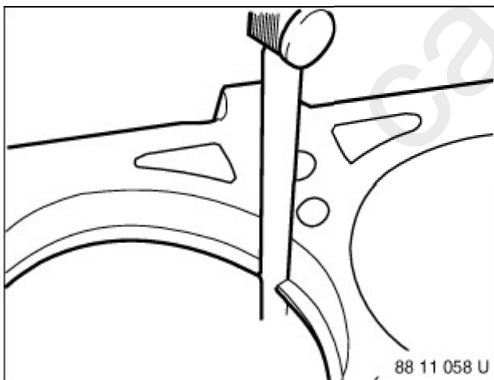
The M-flex ring cannot be removed with piston ring pliers.

Put aside all piston rings in correct sequence and installation position.

It might not be possible to find the identification on used piston rings.

Installation note:

New pistons may only be installed together with new piston rings.

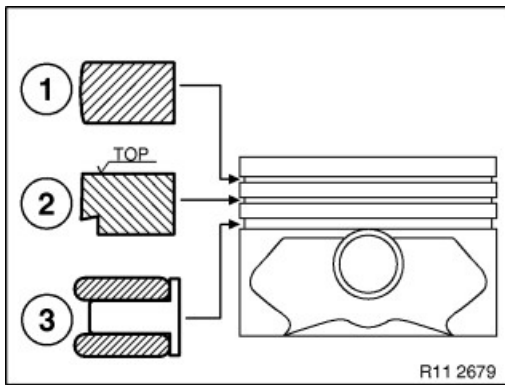


Insert removed piston ring into cylinder bore hole.

With aid of piston (piston crown), position piston ring in its measuring position.

Determine end clearance with a feeler gauge.





Note:

Schematic diagram of piston rings.

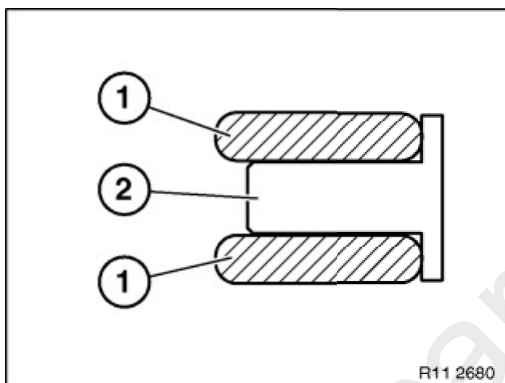
Installation note:

1. Plain rectangular compression ring "top"
2. Piston ring "top"
3. Steel band with M-flex ring



Installation note:

Piston rings with "TOP" identification (1) must point to piston crown.

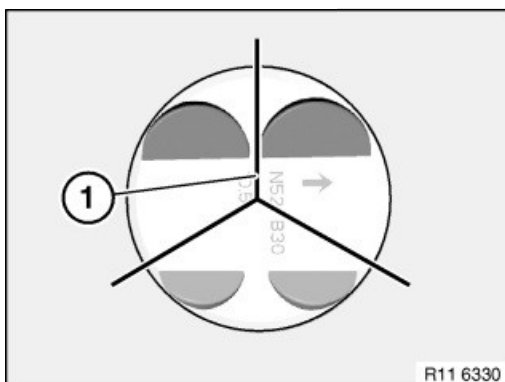


Note:

The M-flex ring comprises two steel band rings (1) and a bearing spring (2).

Installation note:

Insert bearing spring (2) into piston ring groove and then fit steel band rings (1) so that contact points are offset by approx. 120°.



The contact points (1) of the piston rings must be arranged offset by approx. 120°. However, the contact points (1) must not be arranged over the gudgeon pin boss. *Note:* Graphic of N52.



Assemble engine.

