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TECHNICAL REPORT

Roughness in the sealing surface of the cylinder head gaskets

AJUSA

How the surface finish can break a repair. Technical tips to verify the roughness and surface finish for head gaskets.

01

introduction

The head gasket is a fundamental component in an engine, since it must **withstand high temperatures and pressures** generated during the combustion process, in addition to **absorbing movements between the block and the cylinder head**.

To address the variables that contribute to horizontal and vertical movement between these parts, **Ajusa uses advanced sealing technologies** to create a gasket that conforms to and compensates for surface imperfections, while maintaining an even load between the cylinder head and the block.

Although all of our gaskets are made from **OEM equivalent or superior materials**, it is important to note that even the best head gasket cannot seal a poorly prepared surface.

Therefore, it is essential to **inspect and resurface the surface** conditions of the block and head before installing a new head gasket.

02

surface roughness

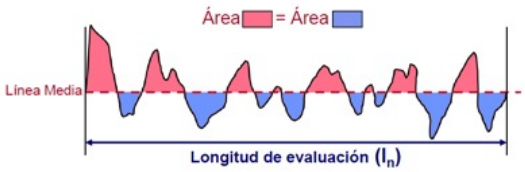
Roughness on metal surfaces is a term that refers to the **texture or roughness of the surface**. This roughness is measured by a scale that indicates the **height of the crests** and valleys on the surface. Roughness measurements include mean roughness (Ra), maximum roughness (Rz), and crest height (Rp).

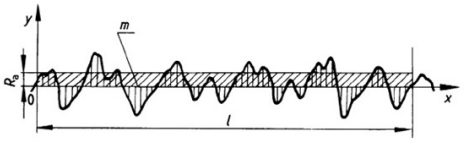
The **mean roughness** (Ra) is defined as the arithmetic mean of the height of the ridges and valleys on the surface. It is the most widely used roughness value in the industry to specify surface roughness. The Ra value is measured in **micrometers** (µm) and the higher the value, the rougher the surface.

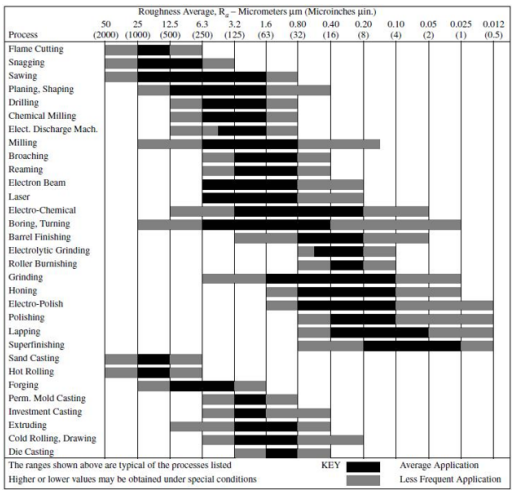
$$Ra = \frac{\Sigma Area1 + \Sigma Area2}{l_n}$$

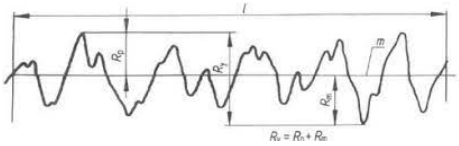
The **maximum roughness** (Rz) is defined as the arithmetic mean of the height between the lowest highest points of the surface. It is measured in **micrometers** (µm) and is used to indicate the depth of the deepest grooves in the surface.

There are other parameters that complement the roughness values, such as the maximum crest height Rp, maximum valley depth Rm, or the maximum profile height, Ry.









Ajusa recommends a finish of:

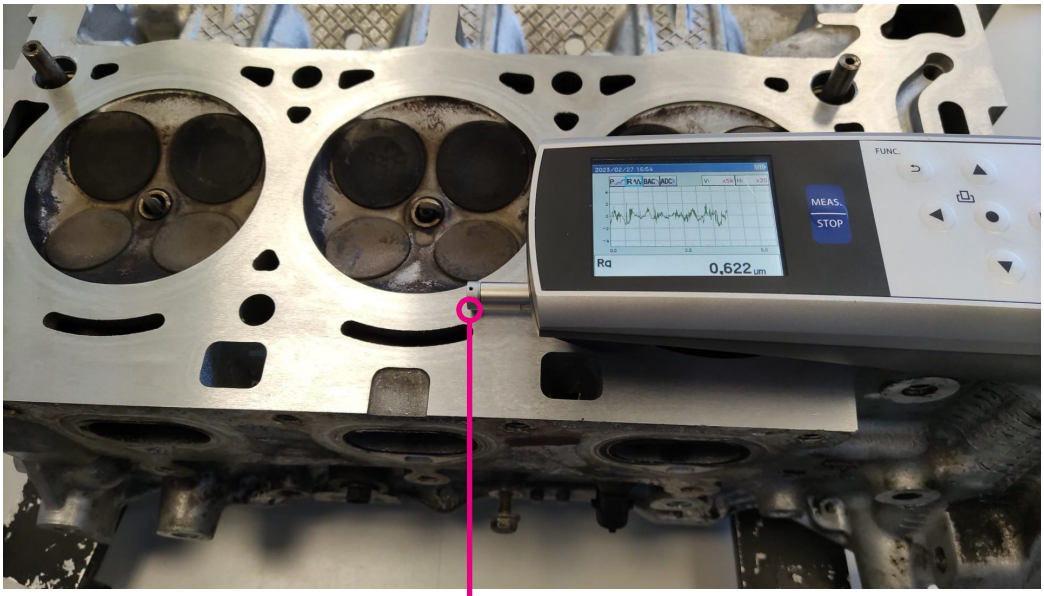
> 0.5 - 1 µm Ra (20 -40 µin) for **aluminum cylinder heads and blocks.**
> 1,5 -1,8 µm Ra (60 -70 µin) for **iron castings.**

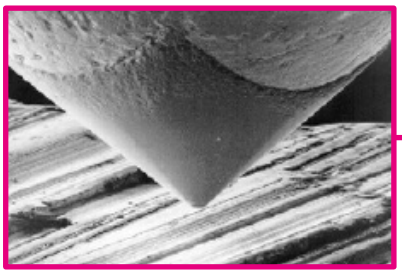
Ajusa uses special coatings for cylinder head gaskets whose materials are designed to fill surface imperfections and allow adequate sealing in the rough environment of the repair. OEM gaskets work well on new, flat, clean surfaces as they require a very good surface finish, but not where the finish is not as smooth.

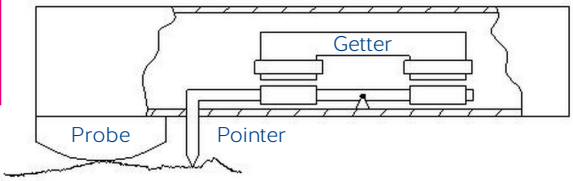
In order not to spoil a good surface finish, it is crucial to check beforehand that the **surface of the elements is flat** and thus avoid possible sealing problems.

Therefore, it is important to **verify that the components** are not deformed. All surfaces must be flat and remain flat after grinding. For proper sealing, flatness should be less than 0.05mm on cylinder head and block.

Material type cylinder head / block	MLS gaskets	Fibermax gaskets
Aluminium	0,5-1 µm Ra	2,3 µm Rz
Iron castings	1,5-1,8 µm Ra	3,8 µm Rz







03

how to choose the right rougness

To achieve a proper surface finish, you must consider the cylinder head and block material, as well as the type and design of head gasket being used.

Each type of joint requires a **particular surface finish**, so it is essential that the finish used is consistent with the type of joint required for the application.

It is very important to use **the correct surface finish** for each type of Ajusa head gasket, be it MLS or FiberMax.

If the surface is **too polished**, the gasket may slip and leak. On the other hand, if the surface is **too rough**, the gasket will have a hard time conforming to surface imperfections and may also cause leakage. To verify the surface finish, a surface finish comparator or roughness gauge can be used.

04

how to measure roughness

There are several instruments that are used to measure the roughness of surfaces, but one of the most common is the **roughness meter or profilometer**.

This instrument uses a probe that **is moved along the surface** of the sample to measure irregularities in its profile. The probe can be mechanical or optical, and can record measurements on different scales, from microns to millimeters.

The roughness meter needle is inserted between the peaks and valleys of the surface, drawing the roughness profile, which is collected and transformed into an electrical signal by the sensor. The pointer is usually diamonded to prevent wear. The **Probe** rests on the surface and acts as a mechanical filter.

To carry out an adequate measurement of the surface roughness using the roughness meter, it is necessary to follow the following steps:

01 | prepare the roughness meter

Make sure that the roughness meter is correctly set up and calibrated for the measurement to be made. This includes selecting the proper measurement scale, contact force, and correction factor based on the type of surface.

02 | preparare the surface

Clean the surface to be measured to remove any dirt or contaminants that could affect the measurement.

03 | position the roughness meter

Place the roughness meter parallel to the surface to be measured. Adjust the support arm of the roughness gauge so that the measurement head is in contact with the surface perpendicularly.

04 | carry out the measurement

Turn on the roughness meter, and it will begin to move the measurement head over the surface in the desired direction. It is important to ensure that the measurement head is in continuous contact with the surface during the entire measurement. The roughness meter screen will show the roughness values in real time.

05 | analyze the results:

After the measurement is complete, analyze the results on the screen of the roughness meter. You can view the roughness profile, the average roughness value and other measurement parameters according to the selected standard and compare it with the roughness values allowed by Ajusa.