

CPI Piston Rod & Oil Wiper Rings FAQ

What is the maximum rod undersizing that can be used when using standard size packing rings?

Providing the piston rod is still concentric, the maximum undersize that a standard sized rod packing can be used on is 0.1% of the original rod size. For example, a set of piston rod packings designed for a 3.00" (76.2mm) diameter piston rod, could be used on a piston rod reduced in size to 2.997" (76.12mm). This guide applies only to segmental type packing and not to triple circle designs. Regarding oil wiper packing, any under sizing of the piston rod is not technically acceptable.

Do radial tangent cut packings share the sealing function through the packing case?

Traditionally it was believed that with radial tangent packing rings the seal was shared between all the seal sets in the packing case and consequently the greater the number of packing ring sets, the longer the life. This theory has been disproved in recent years by both field experience and controlled development tests. In most applications only one set of seals performs the seal function with the others shuttling backwards and forwards in the grooves. It would be possible to design packing case for most pressures that have two main seals and one vent seal.

Why is the vent seal normally double acting?

The vent seal performs two functions:

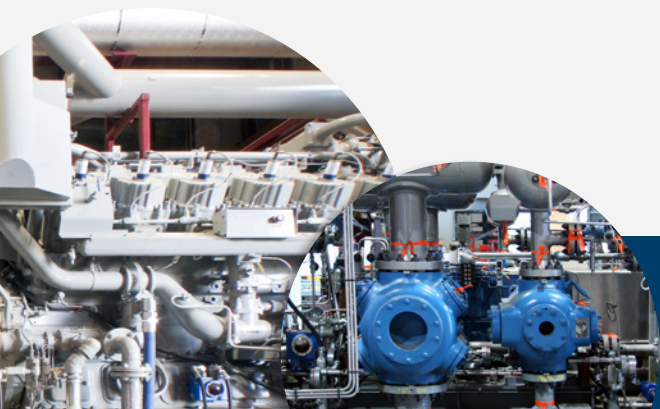
- It is the final seal in the packing case ensuring that any gas that has permeated to the vent position passes into the vent system and not into the distance piece
- If the vent pressure falls below atmosphere, the vent seals in alternative directions, preventing air or distance piece purge gas from being sucked into the vent system

Will plastic packings/wipers wear the piston rods?

No, providing non-abrasive packing/wiper materials are selected and the piston rod is manufactured from suitable material with the correct surface treatment and finish for the application.

What is the main function of a pressure breaker and when should it be used?

Pressure breakers are used in packing cases that sealed gas is compressed at medium to high ratios. In these applications the pressure breaker smooths out some of the peaks in the compression cycle and protects the main packing rings from being damaged. A second application for pressure breakers is on dirty gas service where it is used to reduce the amount of dirt entering the packing case.



Why do some packings use coil springs as garter springs and some use solid wire springs?

Solid wire springs are stronger than garter springs and consequently less prone to breakage. They do have to be accurately matched to the OD of the packing ring but as the packing ring wears, only touch in 3 positions. In gases containing dirt or heavy polymers, coil springs can get clogged, but for most applications the coil spring is the best design as it provides uniform loading and is better able to compensate for wear.

How can you calculate leakage to the vent system?

It is very difficult to accurately calculate what the leakage to the vent system in a packing case will be due to the many dynamic moving parts and seals. Different ring and material combinations will provide a lesser or greater seal, which will have an impact on the sealing and leakage. The piston rod material and surface finish will also affect the sealing capability. CPI, part of the Howden group, has a calculation method which can be used as a guide to what the leakage could be expected to be, but this is just a guide.

Does the surface finish of the piston rod affect packing and wiper ring life?

Yes, particularly in non-lubricated service. As a guide the harder the rod surfaced the finer the surface finish required.

Do the garter springs provide the force to load the packing ring on to the piston rod?

Like piston rings, the main cylinder packing rings are gas loaded on to the piston rod and work best in a cyclic loading situation. The main function of the garter springs is as an assembled device holding the rings in place on the piston rod prior to gas load being applied.

Must back up rings always be metallic?

No, with today's improved polymer alloys the pressure which back up rings are required is much higher compared to filled PTFE rings. CPI's special polymer alloys can be used as back up rings in place of metal backup rings in all but the most demanding of applications.

Why are back up rings used?

Backup rings are also known as anti-extrusion rings and are designed to prevent the sealing element of the seal set, usually the tangent cut ring, from extruding into the gap between the piston rod and the ID of the piston cup. This extrusion is caused by a combination of pressure, temperature and the drag effect of the rod moving backwards and forwards through the packing case.

How do you know that packing rings are fitted the correct direction?

All segmental packing rings have their faces either drill mark or stamped to ensure correct assembly. Those marks should always face towards the pressure.

Does the hardness of piston rods affect the packing ring and wiper ring life?

Yes, particularly in non-lubricated service. As a guide, the higher the discharge pressure the harder the required rod hardness. In general, the minimum rod hardness for good packing ring life is 40 RC.

Should the oil wipers always be changed when the main packings are changed?

Yes, although this is rarely done and is often the main cause of oil leakage from the crankcase.

Is it necessary to have a gas seal in the wiper packing?

Yes. The gas seal in the wiper assembly is normally double-acting.

- It seals the pulsations caused by the crosshead
- And prevents gas that leaks from the compressor cylinder (or the distance piece purge gas) from entering the crankcase and spoiling the crankcase lube oil

Do the packing rings support and guide the piston rod?

No, the packing rings should always be able to float freely in the packing case and should not support or guide the piston rod under any circumstances.

In non-lube gas service, why do the packing rings tend to last longer than the piston and rider rings?

In non-lube gas service the packing rings have to seal against a piston rod that is affected by both the gas in the compression cylinder and air or purge gas in the distance piece. The piston and rider rings see only the process gas. This means that in general the job of the piston and rider rings is more difficult than the packing rings. Particularly in difficult gas service such as bone-dry nitrogen and bone-dry hydrogen. The packing rings also have considerably more material available for wear compared to the rider ring. This tends to be the governing component with respect to when piston and rider rings should be changed.

Does the groove size affect the type of packing rings that can be installed in them?

Yes, the axial width of a packing ring groove used for segmental packing should be a minimum of 16mm. Narrower grooves significantly reduce the alternative designs of rings that can be utilized.

Some cast iron packing and wiper rings are tin plated, why is this?

Tin plating is an attempt to prevent scuffing between the bore of the packing or wiper ring and the piston rod.

Is it better to install packing rings around the piston rod or plunge the rod through a completely assembled and installed packing case?

Providing the piston rod has a bullet that has an OD the same as the piston rod, then it is preferable to plunge the run through a packing case with rings that have already been assembled in the workshop. Installing packing around a piston is difficult and requires considerable care.

Why are non-metallic oil wipers better than metallic wipers?

Unlike the main cylinder pressure packing, oil wipers rely on the garter springs to load them onto the piston rod. Consequently if the wiper packing material is flexible this helps to get a good oil wiping action. The preferred wiper packing material today is plastic, typically CPI grade 100 which is a non-abrasive complex carbon filled PTFE.

How much oil leakage from the crankcase is acceptable?

None.

