

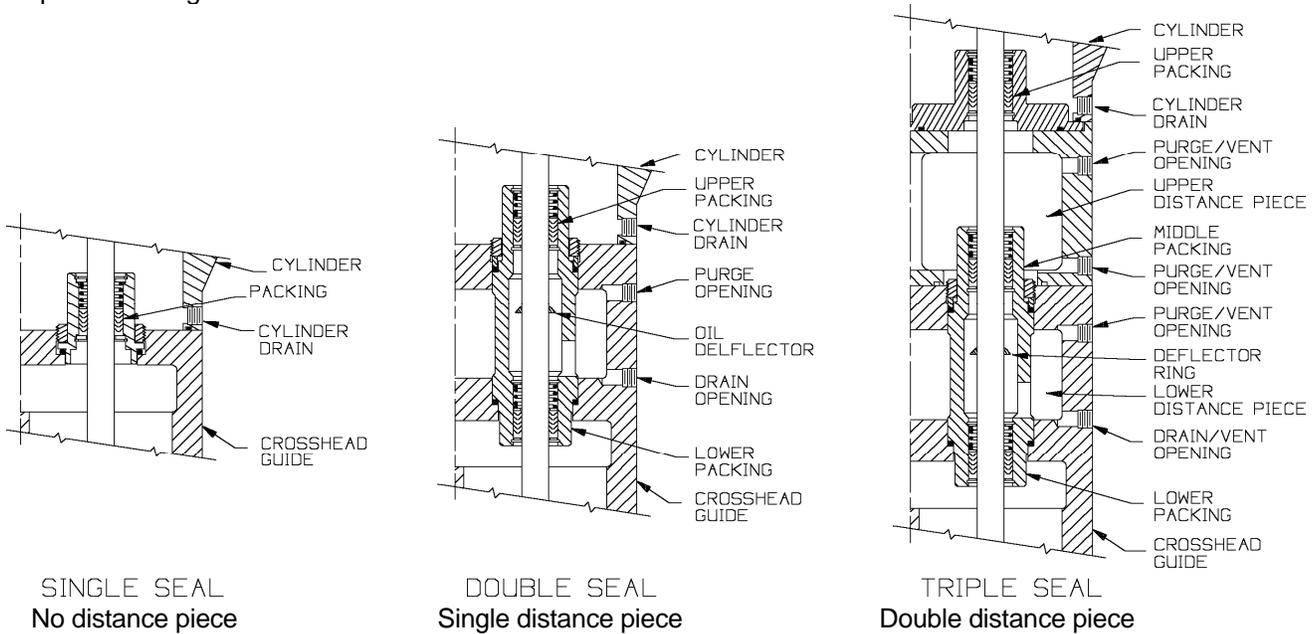
DISTANCE PIECES

A distance piece is a section of a gas compressor between the crankcase and the compressor cylinder which isolates the two areas from one another. On Blackmer compressors, the distance piece is designed to keep oil out of the cylinder providing oil-free operation.

The distance piece consists of two or more sets of rod packing spaced apart such that no part of the piston rod travels through any two sets of packing seals. This prevents oil from being transferred up the piston rod into the cylinder area of the compressor.

Blackmer compressors are available as single seal, (no distance piece), double seal (one distance piece), or triple seal (two distance piece) models. The triple seal models offer the greatest flexibility of controlling possible process gas leakage on these models.

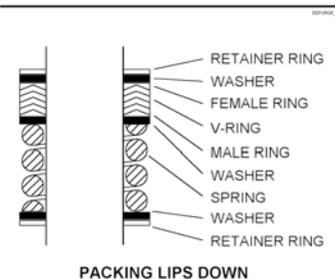
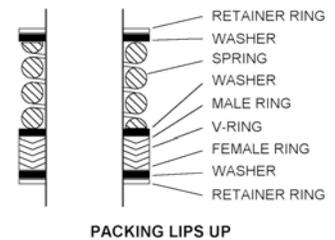
In addition to its oil containment function, the distance piece acts as a process gas leakage control device. The area between the two or three sets of packing can be plugged, purged, pressurized, or vented depending on the intended service. The particular arrangement selected will depend on the degree of leakage control needed and the product being handled.



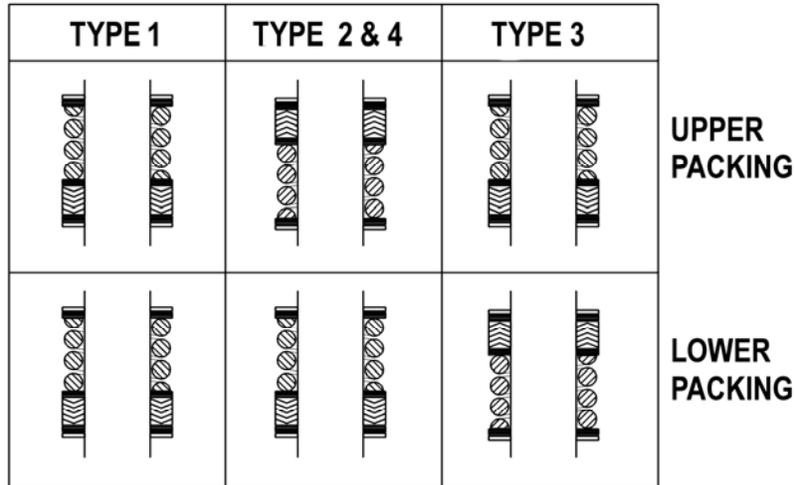
PACKING

Blackmer piston rod packing is a filled PTFE material which is formed into a V-ring shape. Several of the V-rings are stacked together with a male and female ring to form a packing set. A spring, located next to the male packing ring, keeps pressure on the packing set which expands the "V" thus sealing the packing to the piston rod on the inside diameter and the packing box on the outside diameter. Both the piston rod and packing box must be smooth and free of any scratch marks or pitting to provide the proper sealing surface for the packing rings.

This packing is pressure assisted and therefore will seal properly in only one direction. The higher pressure must be on the open side of the "V". Packing on a reciprocating rod will have some minute gas leakage. As the packing wears, the leakage may increase. Several different packing arrangements are available to minimize and control this leakage.



The following information describes the various types for each distance piece style, and their uses.



SEAL ORIENTATION - DOUBLE SEAL COMPRESSORS

DOUBLE SEAL PACKING ARRANGEMENTS

TYPE 1 DISTANCE PIECE PLUGGED:

This is the most commonly used packing arrangement. The pressure in the distance piece will pressurize naturally as the compressor runs, somewhere between atmospheric pressure and suction pressure. This arrangement is used for general gas transfer and is the preferred method in most applications.

DISTANCE PIECE PURGED:

For use with toxic, flammable, or otherwise hazardous gasses, the distance piece can be purged with an inert gas such as nitrogen or dry air. With this packing arrangement, the purge gas should be at a pressure lower than suction pressure. Any process gas that may leak past the first set of packing is carried away by the purge gas. The purge gas can then be vented to a safe location. This method is useful in cases where the process gas can not be contaminated by the purge gas.

DISTANCE PIECE VENTED:

For use with hazardous gasses, the distance piece can be vented. Either of the upper distance piece connections can be piped to a safe location and vented. This eliminates virtually all local leakage at the compressor location. Any gas that escapes, does so in a safe location.

TYPE 2 DISTANCE PIECE tubed to discharge (single stage) tubed to interstage (two-stage units)

This arrangement is used in vacuum suction applications. On single-stage units, the distance piece is pressurized with discharge pressure. This prevents the vacuum suction condition from drawing oil up into the cylinder. If discharge pressure is also below atmospheric pressure, use the pressurized distance piece as described below. On two stage units, the distance piece is tubed to the first stage discharge pressure except in deep vacuum service where the interstage may still be below atmospheric pressure. In this case type 4 would be used.

DISTANCE PIECE PRESSURIZED: (vacuum service)

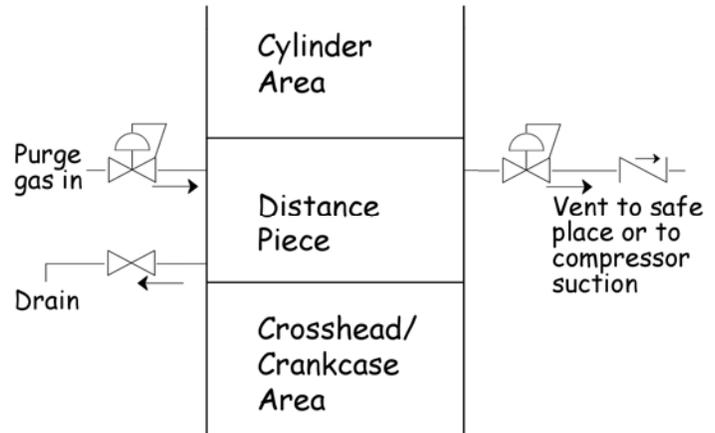
This arrangement is used when a vacuum suction condition exists. If both the suction and discharge pressure are below atmospheric pressure, the distance piece should be pressurized with an inert gas such as nitrogen or dry air at a pressure above atmospheric pressure. This will prevent oil from being drawn up into the cylinder past the upper packing seals.

DISTANCE PIECE PRESSURIZED: (low but positive inlet pressure)

When handling a hazardous gas above or at atmospheric pressure, this packing arrangement can be used with a pressurized distance piece to prevent the process gas from leaking into the crankcase. The gas used to pressurize the distance piece will normally be an inert gas and will be above suction pressure and above atmospheric pressure. A small amount of the inert gas may leak into the compressor cylinder and crankcase, so a supply of gas will be needed.

DISTANCE PIECE PURGED:

This same arrangement can be used with a purge gas when handling a hazardous gas. The purge gas is usually nitrogen or dry air and enters the distance piece at a pressure above suction pressure and above atmospheric pressure. Process gas that may leak past the first set of packing is carried away by the purge gas. The purge gas is then vented into the suction of the compressor through a regulator or needle valve and a check valve. This method mixes the purge gas with the process gas. In most cases, the small amount of purge gas mixed with the process gas is insignificant and will not upset the system. If venting into the process gas is not acceptable, the purge gas can also be piped away to a safe disposal area. Nitrogen flow rate used in the purge is typically only a few (1-3) std. cubic feet per hour.



TYPE 3 VENTED DISTANCE PIECE

This arrangement is used on compressors in applications where it is preferred to have the distance piece vented to an atmospheric vent or to a safe disposal area. The lower packing set is inverted so the packing lips function as oil wipers only. In this configuration the distance piece can not be pressurized.

TYPE 4 DISTANCE PIECE TUBED TO DISCHARGE: (vacuum service)

This arrangement is used only on two-stage units. It is similar to TYPE 2 with the exception that the distance piece is tubed to the second stage discharge rather than the first stage discharge. This option is used when the interstage pressure is below atmospheric pressure.

Note: in some applications where system controls and valving cause the compressor to run in an unloaded condition it may be possible to lose the distance piece pad pressure. In these applications consult the factory. It may be necessary to connect the distance piece to a remote constant pressure source.

TYPE 1	TYPE 5	TYPE 6	TYPE 8	TYPE 7, 9	
					UPPER PACKING
					MIDDLE PACKING
					LOWER PACKING

SEAL ORIENTATION - TRIPLE SEAL COMPRESSORS

TRIPLE SEAL PACKING ARRANGEMENTS

TYPE 1 DISTANCE PIECE PLUGGED:

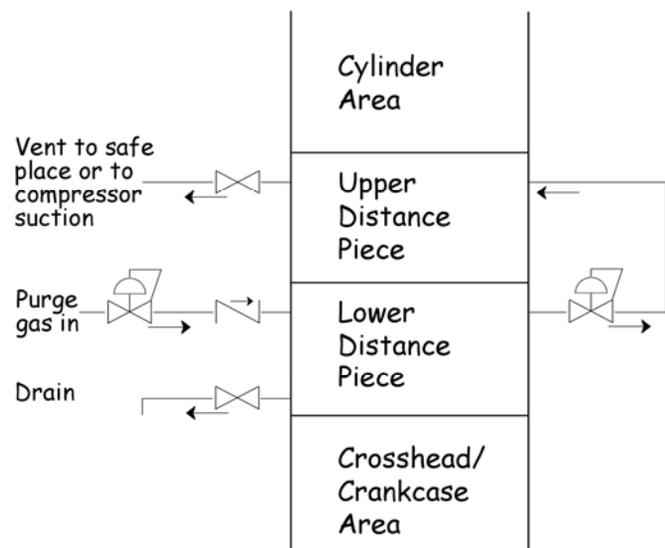
The pressure in the distance pieces will vary between atmospheric and suction pressure. This arrangement is used for general gas transfer. The triple seal compressor offers better leakage containment and control than a standard double seal model with a plugged distance piece.

UPPER OR LOWER DISTANCE PIECE VENTED:

For use with hazardous gasses, the upper or lower distance piece can be vented to a safe location or treated in a disposal solution. This eliminates virtually all local leakage at the compressor location. Any gas that escapes does so in a safe location.

TYPE 5 DISTANCE PIECE PURGED:

This arrangement is used with a purge gas when handling a hazardous process gas. The purge gas is usually nitrogen or dry air and is applied to the lower distance piece at a pressure above atmospheric pressure. The purge gas then passes out of the lower distance piece, through a pressure regulator, and into the upper distance piece at a pressure lower than suction pressure, and slightly lower than the lower distance piece pressure. The upper distance piece then becomes a collection point for any process gas that may leak past the upper set of packing. Any process gas present in the upper distance piece is prevented from entering the lower distance piece by the pressure differential between the two chambers. The purge gas can then be vented to a safe place or treated in a disposal solution. This arrangement eliminates virtually all process gas leakage at the compressor location. Nitrogen flow rate used in the purge is typically only a few (1-3) std. cubic feet per hour.



LOWER DISTANCE PIECE PRESSURIZED, UPPER DISTANCE PIECE VENTED:

This arrangement can also be used with a pressure pad in the lower distance piece. Any leakage of the pad gas (usually Nitrogen) from the lower distance piece will either slowly migrate into the upper distance piece, where it can then be vented to a safe place or in a disposal solution. Any Nitrogen that leaks into the crankcase will vent out through the crankcase vent. Any process gas present in the upper distance piece is prevented from entering the lower distance piece by the pressure differential between the two chambers. This arrangement also eliminates virtually all process gas leakage at the compressor location.

TYPE 6 LOWER DISTANCE PIECE PRESSURIZED, UPPER DISTANCE PIECE PLUGGED:

This arrangement is typically used when handling a hazardous process gas with a suction pressure at or below atmospheric pressure. The lower distance piece is pressurized above suction pressure with an inert gas such as nitrogen. The upper distance piece will tend to stay at a pressure between the nitrogen pressure and suction pressure. A slight amount of contamination of the process gas by the nitrogen should be expected. This arrangement eliminates virtually all process gas leakage.

DISTANCE PIECES PURGED:

This arrangement is used with a purge gas when handling a hazardous process gas with a suction pressure at or below atmospheric pressure. The purge gas is typically nitrogen or dry air and enters the lower distance piece at a pressure above both suction pressure and atmospheric pressure. The purge gas then passes out of the lower distance piece, through a pressure regulator, and into the upper distance piece at a pressure above suction pressure but slightly less than the lower distance piece pressure. Any process gas that may leak into the upper distance piece is prevented from entering the lower distance piece by the pressure differential between the two chambers. The purge gas can then be vented to a safe place, vented to the compressor suction, or treated in a disposal solution. In most cases, when the purge gas is vented to the compressor suction, the small amount of purge gas mixed with the process gas is insignificant and will not upset the system. The purge gas can also be piped away to a safe disposal area if venting into the process gas is not acceptable. Nitrogen flow rate used in the purge is typically only a few (1-3) std.cubic feet per hour.

TYPE 7 UPPER DISTANCE PIECE PRESSURIZED: (Only available on Series 100/300 machines)

This arrangement is typically used when the suction pressure is expected to be below atmospheric pressure. The upper distance piece is pressurized with an inert gas or with process gas from the compressor discharge (interstage pressure on two stage models). This allows the upper packing set to seal under vacuum inlet conditions. If an inert gas is to be used, slight contamination of the process gas by the inert gas should be expected. The lower distance piece can be plugged or vented. If process gas from the compressor discharge is to be used, there will be no contamination of the process gas. In this arrangement the lower distance piece can not be pressurized, and any gas leaking into this section must vent to a safe area. If left plugged, the distance piece will vent into the crankcase and out of the crankcase vent.

Note: venting into the crankcase should only be allowed if the process gas is non-hazardous and will not react adversely to crankcase components or lubricant.

TYPE 8: (Only available on Series 300 triple seal models)

The pressure in the distance pieces will vary between atmospheric and suction pressure. This arrangement is used for general gas transfer. The lower distance piece is vented to the crankcase via a vented lower packing box. In this arrangement the lower distance piece cannot be pressurized. Refer to the parts list page of the unit in question for additional information on Vented Packing Boxes.

TYPE 9: (Only available on Series 300 triple seal models)

This arrangement is typically used when the suction pressure is expected to be below atmospheric pressure. The upper distance piece is pressurized with an inert gas or with process gas from the compressor discharge (interstage pressure on two stage models). This allows the upper packing set to seal under vacuum inlet conditions. If an inert gas is to be used, slight contamination of the process gas by the inert gas should be expected. The lower distance piece is vented to the crankcase via a vented lower packing box. In this arrangement the lower distance piece cannot be pressurized. Refer to the parts list page of the unit in question for additional information on Vented Packing Boxes.



DISTANCE PIECE DRAINS

All lower distance pieces over time, will accumulate a small amount of oil that passes the lower sets of packing. The design of the lower distance piece prevents this oil from reaching the upper distance piece and cylinder. However, this oil must be drained regularly to prevent excess accumulation. The lower distance piece should be checked and drained weekly. All Blackmer double and triple packed compressors have a drain connection on each side of the lower distance piece. A drain valve should be installed in one of the "lower" ¼" npt connections to facilitate draining of any accumulated oil. Both piston rods are accessed through one drain connection. It is not necessary to install drains on both sides of the compressor. (See illustration page 1).

PURGE OR PRESSURIZATION GAS

When purging or pressurizing, it is important to use an acceptable gas. The gas chosen must not react in any way with the process gas. An inert gas such as Nitrogen or dry air is typically used. In most cases, purging or pressurizing is employed in order to contain a corrosive or toxic gas. Many such gases are reactive with water. Standard shop air contains some condensed water and oil vapor and is not dry enough to use as a purge gas. Bottled nitrogen is inexpensive and readily available. This is the ideal gas to use in most applications. When purging, only a few standard cubic feet per hour of the purge gas are usually required. Even less gas is used when only pressurizing a distance piece.