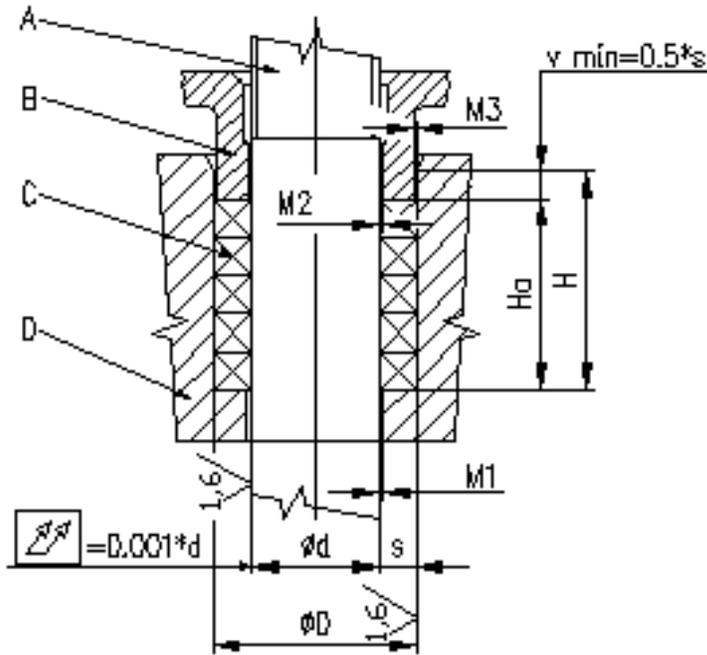


PUMP PACKING

INSTALLATION INSTRUCTIONS

1st step - Preparation and Inspection of the Pump Packing Chamber

- Remove the old pump packing from the chamber with the help of an extractor, leaving no remnants. In the course of this operation make sure that the shaft (shank) is not damaged. Thoroughly clean the chamber and the shaft.
- Inspect the shaft (shank, piston rod) for damage or wear. Measure the wobbling of the shaft. If it exceeds the value of $0.001 * d$ (\varnothing of the shank, or shaft) we recommend repairing or replacing it.



- A shank
- B lid
- C packing
- D chamber
-
- $\varnothing d$ shank
- $\varnothing D$ chamber
- s width of right
- $s = \frac{D-d}{2}$
- v min. height of line
- $v = 0.5 * s$
- Ha packing height
- H height of space
- ∇ max. total wobble = 0,001 * d
-
- Recommended formulas for the calculation of tolerances:
- M1 = 0,02 * s, max. 0.30 mm
- M2 = 0,02 * s, max. 0.30 mm
- M3 = 0,01 * s, min. 0.10 max. 0.30 mm

If the pump packing space does not correspond to the required tolerances shown in the drawing, it is necessary to define the tolerances for example by using fill-in metal rings or in other ways based on the user's capabilities.

2nd step - Preparation of pump packing ring and its insertion into the pump packing chamber

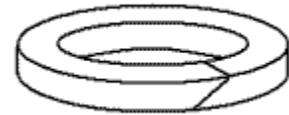
- Devote maximum attention to this step. The largest proportion of leakages is due to incorrect installation!
- Choose the right kind of packing for the given working conditions. You will find a basic

overview of the use of pump packing strings in our catalogue or on the Internet, at www.usseal.com. In the case of special applications and limiting values, please contact the American Seal & Packing. technical support department (tel.: 714-361-1435; fax 714-593-9701)

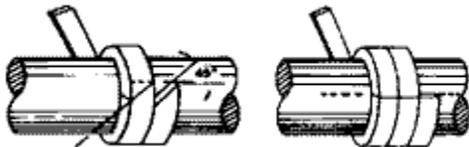
- The packing must be used in the form of individual "rings" - it must never be wound up!
- It is necessary to choose the right dimension of woven packing or ring, otherwise a failure may occur. For more details, see below:

Several ways exist of correctly trimming the packing string. Each one has its advantages as well as disadvantages. Therefore choose the way that you find the most suitable for your needs.

A) Use the pre-pressed pump packing rings (if appropriate, in combination with packing rings made of expanded graphite) whenever these are available. The installation is then very easy and fast. Furthermore, this method minimizes the risk that the packing thus prepared will fail. Not all types of packing rings are suitable for pre-pressing.



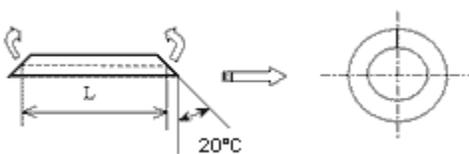
B) Cutting of pump packing rings on a pin (of the same diameter as the shaft) is very easy and often used. Make sure that the incision is made so as to maintain the medium length of the packing **L**. See point C. While the execution of a 45° incision is more demanding, the insertion of a ring thus prepared in the packing chamber is easier. For certain high-speed applications we recommend a vertical incision.



The optimal medium length of the pump packing should be a little longer than the length that we attained by this type of incision, because some pump packing strings contract to some extent after a certain period of operation. (Particularly graphite and PTFE fibers shrink slightly after operating temperatures are reached). See also point C, coefficient **k**.

C) The cutting of pump packing rings on the template requires a precise calculation of the medium length of the packing and skill in inserting pump packing rings into the chamber. See the following formula and illustration:

Formula for the calculation of the medium packing length:



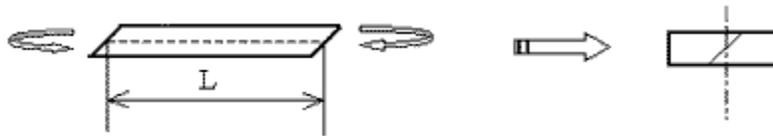
D ... Ø
chamber
d ... Ø
shank

Øshank d (mm)	k coefficient
Up to 60	1.1

k ... coefficient	61 - 100	1.07
	more than 100	1.04

Please keep in mind that the circumference of the outer circle is bigger than the circumference of the inner one, so that in performing the incision an angle of about 20° is required to prevent the formation of a gap on the outer side of the circle. The length must be chosen in such a way that the ring should fit tightly around the shank and that the diagonal ends of the pump packing should be in close contact. An incorrect length causes a lack of tightness in the packing. It is recommended to check the length by wrapping the packing around the shank or by using a preparatory packing of the same diameter. N.B.: Coefficient k takes into account the contraction (shrinkage) of the packing fibers after a certain period of operation.

D) We recommend: Cutting the pump packing rings on a cutter (see our catalogue of asbestos-free packing) is a very simple process, used frequently. No calculations are required. In turning the ring (in the illustration the view is spatially turned by 90° with respect to the previous one) we can neglect the fact that the circumference of the outer circle is greater than the circumference of the inner one, which is acceptable in view of the 45° lock. (Otherwise a further incision would need to be made as per point C and the length of the preparatory packing would need to be approx. 1/3*S longer. For practical reasons a second incision is usually not performed.)



Warning: Carefully compact each ring into the packing chamber before adding further rings and make sure that the connections of the following circles are alternately arranged at 180° intervals (if only 2 rings are installed), at 120° intervals (for 3 rings) and at 90° intervals (if the set comprises 4 or more rings). For pressures in excess of 100 bar it is recommended that pre-pressed rings be used, made out of a woven packing material.

3rd step - Tightening of pump packing chamber and initial run

Tightening and initial run of the valve: After installing all rings, insert the packing lid and manually tighten the tightening bolts. Then, using a torque wrench, successively tighten each bolt in turn in four stages, 25, 50, 75 a 100% of the tightening torque. After each stage of tightening, open and close the valve by turning the shank. The tightening torque must be chosen such that the pump packing should be tight and the valve should be operable.

The tightening bolts must be in flawless condition (undamaged, clean and un-corroded) and lubricated with a suitable lubricant whose heat stability is higher than the operating temperature. Once the bolts have been tightened, we recommend opening and closing the valve several times,

checking the tightening torque and in case of need, further tighten the bolts. It is also appropriate after 24 hours of operation, to tighten the bolts even in the case that no leakages of the medium area detected-this is to compensate the compression of the packing. To ensure permanent tightening tension it is advisable to use disk-shaped spring washers providing permanently optimal tightening tension. In this case it is not necessary to further tighten the packing in the course of operation.

Recommended tightening pressures of the pump packing inside the chamber:

- a) liquid - up to 580 PSI 2x working pressure (min. 5 N/mm²)
above 580 PSI 1,5x working pressure (min 5 N/mm²)
- b) gases - up to 580 PSI 5x working pressure (min. 10 N/mm²)
580 PSI - 2900 PSI 2,5 - 5x working pressure
above 2900 PSI 1,5x working pressure

Tightening and initial run of pump packing: After the installation of all rings into the pump packing, please tighten the nuts on the bolts of the pump packing lid manually or only with the application of only a very slight force on the bolts. Start up the pump and then continue to tighten the nuts evenly on the pump packing lid until the permeability is reduced to an acceptable level. Never try to stop the permeability completely, otherwise excess heat will result, which will reduce the service life of the pump packing and increase the wear on the shaft. As you watch the pump packing in operation, always tighten all of the nuts to the same degree and wait 10 - 15 minutes for the pump packing to settle down prior to performing the next adjustment.

Recommended pressure of the pump packing: 1.5 - 2x the working pressure of the medium

N.B.: The practical values of the tightening pressures depend on other factors as well (construction, condition of the space being sealed, temperature, viscosity, etc.); for this reason the results of the pump packing may differ even under what may appear to be identical conditions.

If you have any questions please contact American Seal & Packing at sales@americansealandpacking.com or 714-361-1435