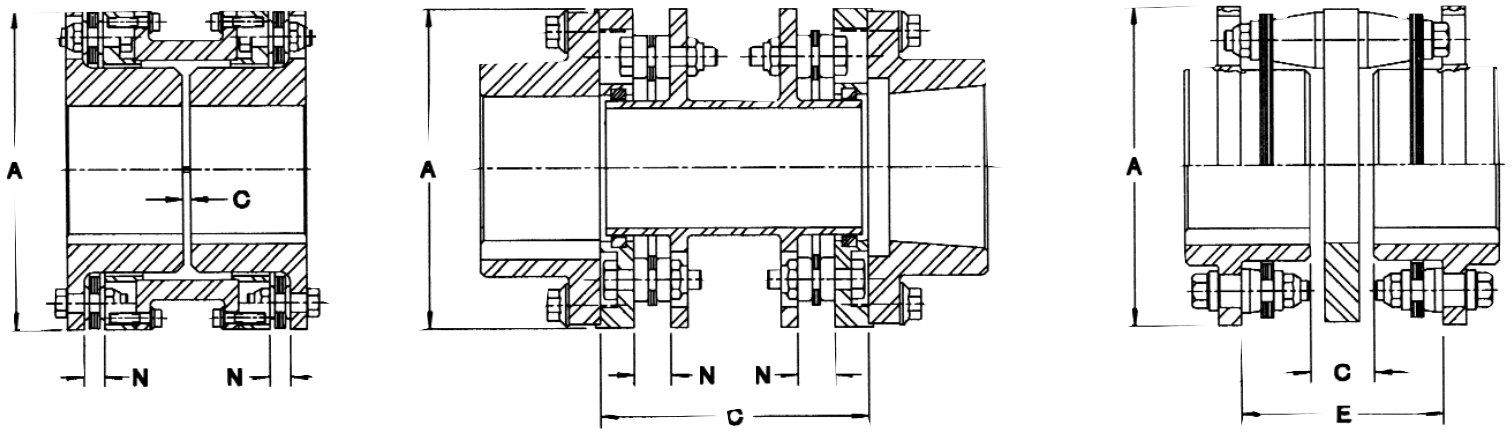
MONITORING AND INSPECTION

Thomas®

Installation Instructions



I. PURPOSE

Monitoring and inspection of the Thomas disc pack in the field.

II. GENERAL INFORMATION

The flexible disc-type coupling is designed for long life when operated within the torque and alignment limits as outlined in the Catalog – Bulletin No. 2000 5/93. The information provided here may also be used for visual determination of the condition of the disc packs.

A well chosen flexible disc coupling operates indefinitely with low cross loading of the connected shafts, has low power absorption, and induces no vibrations or resonances into the system.

The installation of a flexible disc coupling is critical. Various problems could arise during mounting of the hubs and the coupling assembly process. Burrs, dirt and grit on either the shaft or in the bores can cause the hubs to gall during mounting. Poorly-fitted keys can also gall and not seat correctly.

Concentrated heat on the hubs will cause distortion. The coupling must be properly assembled and the locknuts tightened in accordance with the installation instructions. Loose bolts will cause elongation of the disc bolt holes and eventual failure.

The most common forms of failure in disc fatigue due to excessive flexure. This is usually caused by poor initial alignment of the connected machines. It also can be brought about by operational conditions. The following gives some ideas to assure the coupling is operating satisfactorily.

III. DETECTION

The Thomas disc coupling is easily inspected. Visual analysis may point to possible drive system problems. Proper evaluation of the disc packs and connecting parts may save considerable maintenance costs and downtime. When a disc coupling starts to fail, it is usually from the outer disc of the laminated pack and progresses towards the center of the pack. See figure 1.

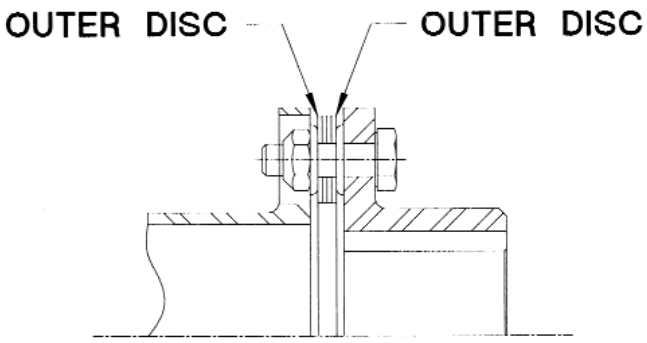


FIGURE 1

Because of this progression, the deterioration of the coupling disc pack may be detected before ultimate failure.

A. Detection of trouble with the equipment in operation.

1. **Monitored Equipment.** Most equipment of this type is continuously monitored with vibration sensors. As a coupling disc pack deteriorates, it loses some pieces of the disc pack which causes unbalance. This unbalance can be detected by the vibration monitoring equipment. This piece-by-piece deterioration allows controlled shut-down before ultimate disc pack failure.

2. **Unmonitored Equipment.** Couplings using a guard with either an open bottom ("U" Type) or open mesh can give early visual warnings. Pieces of the disc pack found under the open "U" guard or seen lying inside the expanded metal guard are a good reason to shut the unit down. Now inspect the coupling, replace the disc packs, and realign the equipment.

B. Detection of trouble with equipment out of service and guard removed:

Here are some of the more evident visual inspection criteria and recommended corrective procedures.

1. Reddish brown color bleeding out between disc laminations at the O.D. of the pack. This is an indication of fretting and/or chemical attack of the disc material. See Figure 2.

2. Fine line crack starting in the outer disc, tangent to the washer O.D. This is an indication of misalignment and can be seen by looking at the outside edge of the disc pack. See Figures 2, 8 and 9.

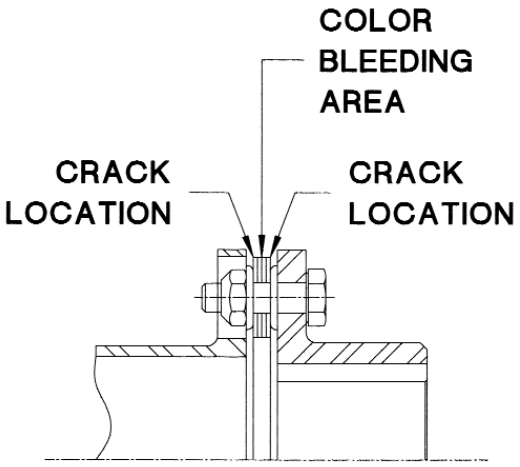
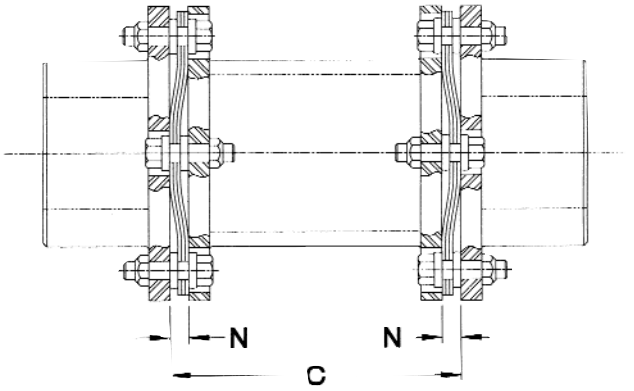


FIGURE 2

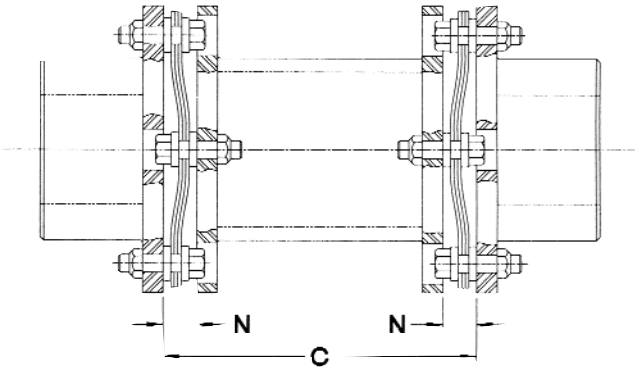
3. Disc pack is wavy and dimension between flange faces "N" is smaller than indicated in the installation instructions or applicable assembly drawing. See Figure 3. This indicates that the coupling has been installed in a compressed condition or equipment has shifted axially during operation. Check for shaft thermal growth conditions. Realign axial position of equipment so the coupling operates with a neutral, flat disc pack.



COMPRESSION

FIGURE 3

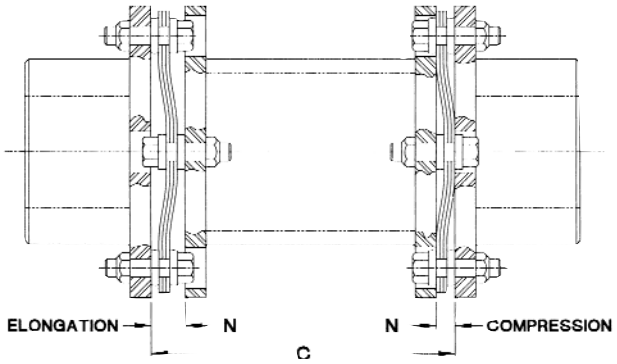
4. Disc pack is wavy and dimension between flange faces "N" is larger than specified on installation instructions or applicable assembly drawing. See Figure 4. This indicates that the coupling has been installed in an elongated position or equipment has shifted axially during operation. Realign axial position of equipment so coupling operates with a neutral, flat disc pack.



ELONGATION

FIGURE 4

5. Disc packs (both ends) are wavy. One end is compressed, and the other end is elongated. (See Figure 5). The conditions can be reversed by moving the center member towards the elongated end. This is called "oil canned" disc packs. The disc pack has no neutral center where it remains flat and parallel with the end flanges.



OIL CAN

FIGURE 5

This condition can be the result of:

1) Tightening the disc pack locknuts while the disc packs are in the compressed or elongated coupling position. See Figure 3 and/or 4.

2) Tightening of disc pack locknuts while coupling is misaligned or other end of spool is hanging unsupported.

3) Bound up bolt(s) in the bolt hole(s).

4) Damaged discs which could be caused by abnormal running conditions, misuse, or loose bolts.

To correct "oil canned" disc pack:

1) Loosen all the disc pack locknuts. Correct the axial spacing of the coupling as necessary with the coupling aligned and spacer fully supported. If "oil canned" conditions disappears, retorque locknut while coupling is in its neutral position.

2) If (1) above is not successful, determine that all bolts, with locknuts loose, can be turned by hand. If any bolts are tight, the bolt holes should be cleaned out by lightly reaming the flange so that the bolt turns by hand in the hole. Reassemble and torque the locknuts while coupling is in its neutral position.

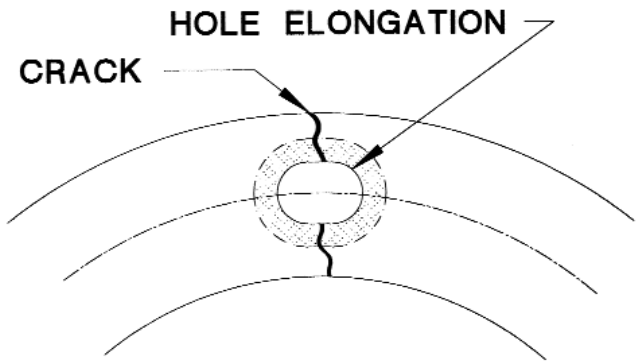
3) If the discs in the pack are permanently deformed, replace the disc pack with a new one and reassemble the coupling.This permanent deformation could be caused by a severe torque overload, abnormal axial loads, or even loose bolts. The cause of the deformation must be corrected before restart.

The coupling, as finally assembled, should have a neutral center where the center member is free to float axially with out snapping from one end to the other when moved by hand.

IV. ANALYSIS OF FAILED DISC COUPLINGS

In the event of a coupling failure, a thorough investigation should be made to determine the cause. The most common causes of failure are improper coupling selection, improper assembly, excessive misalignment, and corrosive attack.

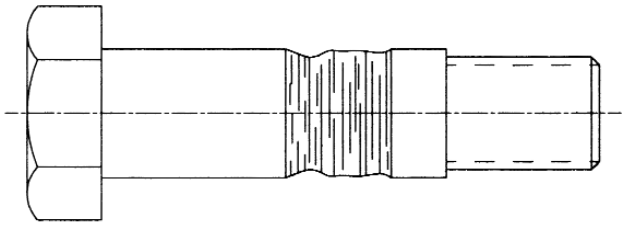
1. Disc broken through the bolt hole indicates loose coupling bolts. See FIgure 5. Replace disc pack and tighten locknuts to specified torque value.



LOOSE BOLTS

FIGURE 6

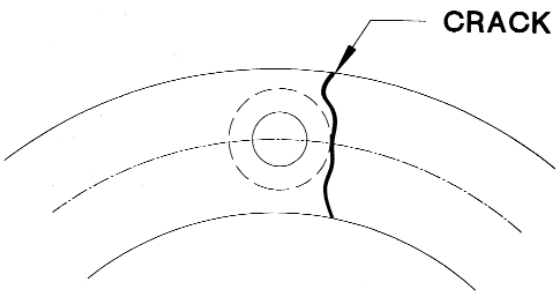
2. Discs embedded into bolt body are usually the result of a loose bolt or a severe torque overload. See Figure 7. Replace bolt and disc pack. Tighten locknut to proper torque. Do not torque the bolt as insufficient bolt stretch may occur.



LOOSE BOLTS

FIGURE 7

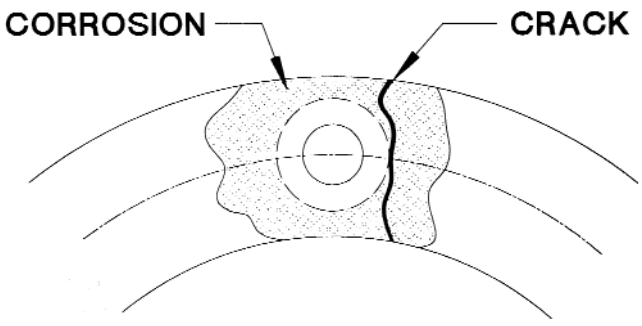
3. Disc broken adjacent to washer face usually indicates excessive shaft misalignment during operation. See Figures 1 & 8. This type of disc failure usually starts with outer disc and progresses through the disc pack. Realign equipment and replace both disc packs. Make hot check of alignment to assure it is within coupling misalignment capacity.



EXCESSIVE MISALIGNMENT

FIGURE 8

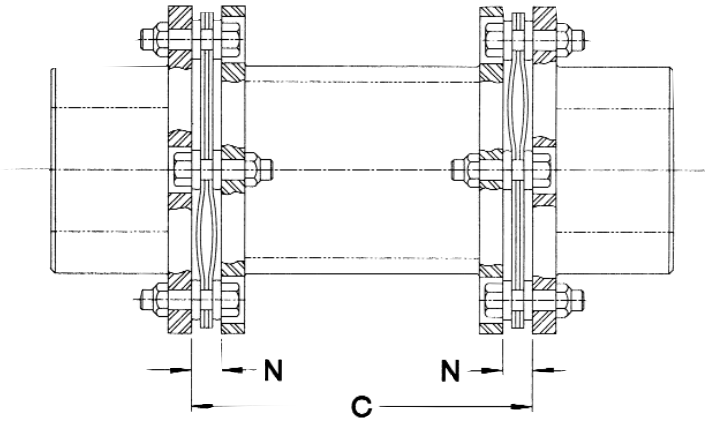
4. Disc broken adjacent to washer face with fretting corrosion present in the area of crack usually indicates excessive shaft misalignment during operation. Also, iron oxide will most likely be evident on outside of disc pack. See Figures 2 & 9. This is sometimes associated with a coupling that has been in service for several years and/or operating in a corrosive atmosphere. Breaks will first appear in outer discs and progress through the disc pack. Replace both disc packs and realign the equipment. Different disc pack material may also be considered.



EXCESSIVE MISALIGNMENT WITH CORROSION

FIGURE 9

5. The disc pack has a bulge near the center or is bowed toward one flange in alternate chordal sections. See Figure 10. This condition is a result of a large torque overload, induced into the system, beyond the peak overload capacity of the coupling. The remaining disc pack chordal sections will be straight and tight. This indicates improper coupling selection or a momentary system torque overload. If bulged or bowed conditions appears in one chordal section only, there may be a loose bolt on one side of the distortion. Loosen all coupling locknuts and unseat the bolts. The bulge should release and flatten out. Retorque locknuts. If distortion does not disappear, replace disc pack and retorque locknuts.



TORQUE OVERLOAD

FIGURE 10

SUMMARY

Thomas disc couplings are designed for infinite life. They must be properly selected, installed and aligned to assure reliable service. Because of the design principles, catastrophic failures are very rare. Sufficient time usually exists to repair or correct a deteriorating situation before ultimate failure.

For further assistance, call Rexnord Corp. Coupling Operation
Warren, PA – **814-723-6600,** Fax - 814-726-1740